17077

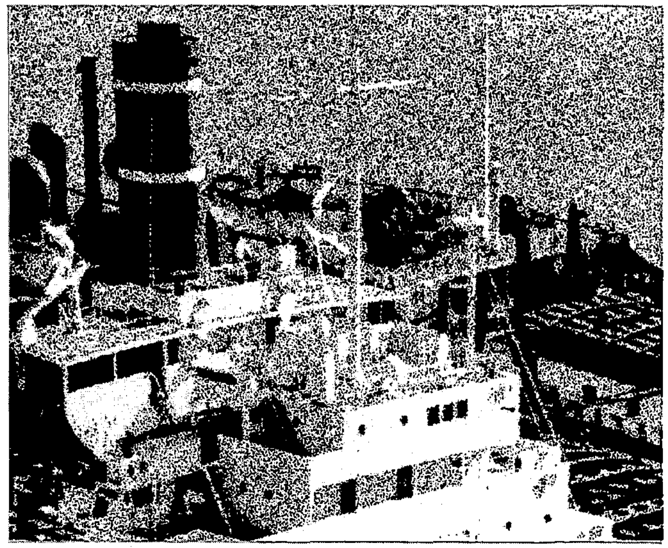
US Army Corps
of Engineers
Baltimore District

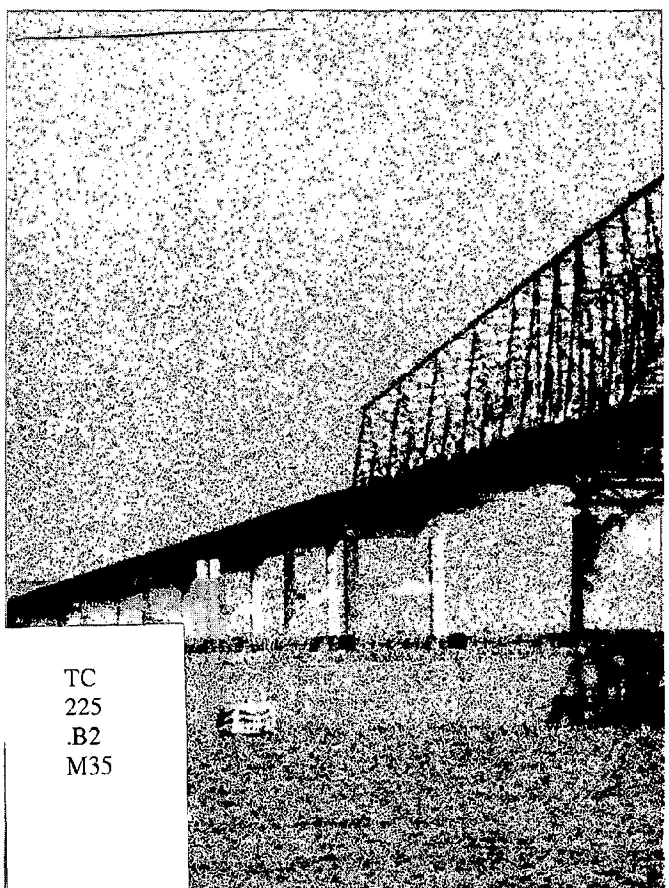
Final / August 1981

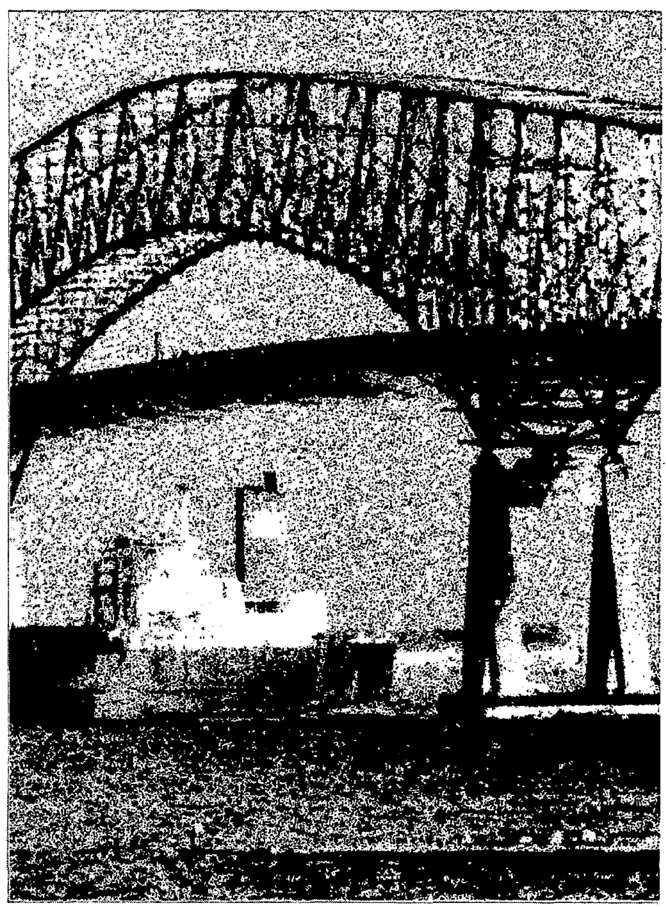
Combined Phase I and II
General Design Memorandum

Main Report & Environmental Statement

Baltimore
Harbor and Channels,
Maryland and Virginia







U.S. Army Corps of Engineers.

BALTIMORE HARBOR AND CHANNELS

MARYLAND AND VIRGINIA

COMBINED PHASE I AND II GENERAL DESIGN MEMORANDUM

SYLLABUS

A plan of improvement to deepen the existing channels and approaches to Baltimore Harbor to meet the existing and prospective needs of navigation was authorized by the Congress (1970 River and Harbor Act, P.L. 91-611) for construction to an amount not to exceed $40,000,000 for initiation and partial accomplishment following approval by the Office of Management and Budget, the Secretary of the Army and the President. The Office of Management and Budget approved the project in March 1975 and the Secretary of the Army and the President approved the project in June 1975.

This combined General Design Memorandum (GDM) presents a review of the economic, engineering, and environmental feasibility of the authorized plan of improvement.

The project provides for the deepening to 50 feet of the main shipping channel to the Port of Baltimore, from the Virginia Capes to Fort McHenry, with channel widths of 1,000 feet in the Virginia channels and 800 feet in the Maryland Channels; deepening of the Curtis Bay Channel to 50 feet for a width of 600 feet; and deepening of the East and West Channels of the northwest Branch to 49 feet and 40 feet, respectively, for a width of 600 feet.

The investigations for the GDM have been coordinated with the responsible Federal, state, and local agencies, and institutions. The project is strongly supported by the State of Maryland.

The estimated total first cost for the recommended project is $301.5 million. The benefit-cost ratio for the overall project is 5.5 to 1.0.

BALTIMORE HARBOR AND CHANNELS

MARYLAND AND VIRGINIA

COMBINED PHASE I AND II GENERAL DESIGN MEMORANDUM

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BALTIMORE HARBOR AND CHANNELS

MARYLAND AND VIRGINIA

COMBINED PHASE I AND II GENERAL DESIGN MEMORANDUM

PERTINENT DATA

Authorizing Act:	Section 101, River and Harbor Act of 1970, Public Law 91-611	
Project Document:	House Document No. 94-181, 94th Congress, 1st Session	
Description:	Deepening to 50 feet of the main shipping channel to the port of Baltimore, from the Virginia Capes to Fort McHenry, with channel widths of 1,000 feet in the Virginia channels and 800 feet in the Maryland channels; deepening of the Curtis Bay Channel to 50 feet for a width of 600 feet; and deepening of the East and West Channels of the Northwest Branch to 49 feet and 40 feet, respectively, for a width of 600 feet.	
First Costs:	Federal	\$232,850,000
	Non-Federal	\$68,680,000
	Total	\$301,530,000
Annual Costs for Project Modification:		\$ 28,281,000
Annual Benefits:	Transportation savings in the deep-draft traffic of Iron Ore, Coal, Sugar, Grain, and Petroleum amounting to:	
		\$156,456,000
Economic Justification:	Benefit to cost ratio of 5.5 to 1.0	
Project Functions:	Navigation improvement	

Physical Data:

Channel	Approximate Length (miles)	Width (ft)	Depth (ft)	Initial 1/ Dredging (1,000 cy)	Additional Annual Maintenance (1,000 cy)
Maryland Channels					
Craighill Entrance and Craighill Channel	6.8	800-1,700	50	10,828	0
Craighill-Cutoff Angle and Cutoff Section	4.1	800-1,800	50	7,350	0
Cutoff-Brewerton Angle and Brewerton Section	4.6	800-1,700	50	7,757	0
Brewerton-Ft. McHenry Angle and Ft. McHenry Section	4.4	800-1,400	50	9,235	0
Curtis Bay Channel	2.3	600	50	3,080	0
Northwest Branch - East Channel	1.0	600	49	1,673	0
Northwest Branch - West Channel	1.1	600	40	1,285	0
SUB-TOTAL	24.3			41,208	0
Virginia Channels					
York Spit Channel	18.2	1,000	50	19,470	184
Rappahannock Shoal Channel	8.9	1,000	50	8,603	0
Cape Henry Channel	2.7	1,000	50	2,515	230
SUB-TOTAL	29.8			30,588	414
TOTAL	54.1			71,796	414

1/ Includes 2-foot allowable overdepth dredging.

SECTION A

BALTIMORE HARBOR AND CHANNELS

MARYLAND AND VIRGINIA

COMBINED PHASE I AND II GENERAL DESIGN MEMORANDUM

INTRODUCTION

1. The navigation improvements under study consist of widening and deepening the existing Federal channels and approaches to the Port of Baltimore, excluding Chesapeake and Delaware Canal approach channels. House Document No. 94-181, 94th Congress, 1st Session, Baltimore Harbor and Channels, Maryland and Virginia, is the Project Document for this study.

2. By approval of the Chief of Engineers, the Phase I and II portions of post-authorization study have been combined into one General Design Memorandum. The decision to combine Phase I and Phase II study was based on the following:

a. The 1970 project authorization provided for initiation and partial accomplishment of the 50-foot project, thereby eliminating the need for a separate Phase I report to Congress for construction authorization.

b. The project formulation and design is relatively simple since the channels have been deepened and maintained previously to 42 feet and only need to be lengthened to the 50-foot depth curves, deepened and widened where necessary.

c. Since the project does not involve extremely detailed plans, most of the formulation that would be included in the Phase II report would be repeated from the Phase I document.

3. The environmental, economic, and engineering analyses conducted for this study are contained within this report. The accompanying Environmental Impact Statement provides a summary of all investigations and findings.

SECTION B

PURPOSE OF STUDY

1. Prior to initiation of the General Design Memorandum (GDM), the findings of the most recent investigations of the project were contained in the Review Report, Baltimore Harbor and Channels, June 1969, which was subsequently supplemented by a report entitled, Baltimore Harbor and Channels, Maryland and Virginia - Supplemental Information Requested by the Office of Management and Budget to June 1969 Review Report, 19 July 1974. The purpose of these prior reports was to evaluate the need for, and advisability of, deepening the existing channels and approaches to Baltimore Harbor in order to meet the existing and prospective needs of navigation. These reports have been printed as House Document No. 94-181.

2. The purpose of this study is to affirm the authorized plan of improvement; taking into account environmental and technical considerations, economic feasibility, social impact, public involvement; and refine the design, construction schedule, and operation/maintenance plan for the authorized improvements.

SECTION C

PROJECT AUTHORIZATION

PRIOR AUTHORIZATION

1. Prior authorizations in the interest of navigation improvements for Baltimore Harbor and Channel are listed in Table C-1 and thereby provide a brief history of Federal improvements in Baltimore Harbor. Authorizations prior to 1917 are not listed.

TABLE C-1

PRIOR AUTHORIZATIONS

Acts	Work Authorized	Documents
Aug 8, 1917	Branch channel 35 feet deep to head of Curtis Bay, and one 35 feet deep and 400 feet wide from Fort McHenry to Port Covington entrance channel, thence 150 feet wide to Ferry Bar, and thence 27 feet deep and 150 feet wide to Hanover Street Bridge, widen approaches and bends, and enlarge anchorage basin near entrance. Inclusion of Patapsco River and tributaries into one project for Baltimore Harbor.	H. Doc. 799, 64th Cong., 1st sess.
Jan 21, 1927	Change in location of anchorage near upper end of Fort McHenry Channel.	
Jul 3, 1930	Increased anchorage facilities	Rivers and Harbors Committee Doc. 11, 70th Cong., 1st sess.

Table C-1 Continued
Prior authorization

Acts	Work Authorized	Documents
Jul 3, 1930	For 37-foot depth in that portion of channel to Baltimore lying between 37-foot depth curve near Baltimore Light to Sparrows Point entrance channel; widen angle between Fort McHenry and Ferry Bar Section; and for width of 400 feet in Curtis Bay section.	H. Doc. 86 85th Cong., 1st sess.
Oct 17, 1940	For 22-, 18-, and 15-foot channels in Curtis Creek from 22-foot depth below Pennington Ave. Bridge to upper end of marginal wharf of U.S. Ordinance Depot.	Adopted as a national defense project. (No printed report.)
Mar 2, 1945	Uniform main channel 39 feet deep from the ocean through York Spit section and Craighill Entrance to Fort McHenry, additional anchorage areas, 2,400 feet long, 1,200 feet wide, and 30 feet deep; a connecting channel 400 feet wide and 27 feet deep from Cutoff Brewerton Angle in main channel to Inland Waterway from Delaware River to Chesapeake Bay; a channel in Curtis Creek 200 feet wide and 35 feet deep from head of existing 35-foot project channel in Curtis Bay to a point in creek about 750 feet below Pennington Avenue Bridge.	H. Doc. 741, 79th Cong., 2d sess.
Mar 2, 1945	A channel 22 feet deep and 200 feet wide from 22-foot depth curve south of Baltimore & Ohio R.R. bridge about 2,800 feet to vicinity of Arundel Cove, thence 100 feet wide in Arundel Cove for about 2,100 feet; with an anchorage basin about 700 feet square adjacent to channel southwesterly of Coast Guard wharf.	In accordance with plans on file in the Office, Chief of Engineers.
Jul 3, 1958	Main channel 42 feet deep and 1,000 feet wide in Cape Henry section at entrance to Chesapeake Bay and in York Spit section, 42 feet deep and 800 feet wide in Rappahannock Shoal	H. Doc. 86, 85th Cong., 1st sess.

Acts	Work Authorized	Documents
	section and in approach channel to Baltimore Harbor from Craighill Entrance to Fort McHenry, with widening at entrance and bends; channels 42 feet deep and 600 feet wide in Curtis Bay and Ferry Bar sections of harbor; a connecting channel 35 feet deep and 600 feet wide from main channel to approach channel to Chesapeake and Delaware Canal, and for three disjointed sections of channels of same depth and width in Chesapeake Bay leading to Chesapeake and Delaware Canal; and to provide Federal maintenance of a 39-foot depth in Northwest Branch, in areas dredged to that depth by local interests.	

2. The project for Baltimore Harbor and Channels was adopted by the River and Harbor Act approved 8 August 1917 and provided for additions to the project existing at that time and for the inclusion of all Federal river and harbor works in the Patapsco River, its tributaries, and approaches into one project. Adopted by the Act of 1917, and modified by the River and Harbor Acts approved 21 January 1927, 3 July 1930, 17 October 1940, 2 March 1945, and 3 July 1958. As of 3 July 1958, the project consisted of:

a. A uniform main channel 42 feet deep, between the Virginia Capes and Fort McHenry at Baltimore, Maryland, with dimensions as follows:

(1) Cape Henry Channel: 42 feet deep and 1,000 feet wide from the 42 foot depth curve in the Atlantic Ocean to that depth in Chesapeake Bay a distance of 1.0 miles.

(2) York Spit Channel: 42 feet deep and 1,000 feet wide connecting the 50-foot depth curves in Chesapeake Bay near York Spit, a distance of 10.4 miles.

3) Rappahannock Shoal Channel: 42 feet deep and 800 feet wide connecting the 42-foot depth curves in the Chesapeake Bay opposite the Rappahannock River, a distance of 5.3 miles.

(4) Baltimore Harbor Approach Channels: 42 feet deep and generally 800 feet wide, widened at the approach and bends, from the 42-foot depth curve in Chesapeake Bay opposite the mouth of the Magothy River to Fort McHenry on the Patapsco River a distance of 19.9 miles.

b. Branch channels with dimensions as follows:

(1) Connecting Channel to Chesapeake and Delaware Canal Approach Channel: 35 feet deep, 600 feet wide, and 13.0 miles long from the Cutoff-Brewerton Angle in the main channel to the 35-foot depth curves in the natural channel on the east

side of Chesapeake Bay which is a part of the inland waterway from Delaware River to Chesapeake Bay. The channel includes the Brewerton Extension, Swan Point, and Tolchester Sections.

(2) Curtis Bay: 42 feet deep, 600 feet wide, and 2.3 miles long from the main channel to and including a 900-foot wide turning basin at the head of Curtis Bay.

(a) A channel, 35 feet deep and 200 feet wide, from the 42-foot channel in Curtis Bay to 750 feet downstream of the Pennington Avenue Bridge.

(b) A channel, 22 feet deep and generally 200 feet wide, from the 35-foot channel to and along the marginal wharf of the Curtis Bay Ordinance Depot.

(c) An irregularly shaped, 3-acre basin, with a depth of 118 feet, adjacent to the head of the 22-foot channel.

(d) A basin, 15 feet deep and 450 feet wide, from the end of the 22-foot channel to the end of the marginal wharf.

(e) A channel, 22 feet deep and 200 feet wide, from the 22-foot channel south of the Baltimore and Ohio Railroad Bridge to the vicinity of Arundel Cove, a distance of 2,800 feet, thence 100 feet wide in Arundel Cove for a distance of 2,100 feet, with an anchorage basin 700 feet square, adjacent to the channel and southwest of the wharf of the Coast Guard Depot at Curtis Bay.

(4) Middle Branch:

(a) Ferry Bar East Section: A channel, 42 feet deep and 600 feet wide, from the main channel at Fort McHenry to Ferry Bar, a distance of 1.4 miles.

(b) Ferry Bar West Section: A channel, 35 feet deep and 400 feet wide, from the Ferry Bar East Section to Ferry Bar, a distance of 0.8 miles.

(c) Spring Garden Section: A channel, 27 feet deep and 250 feet wide, from Ferry Bar to and including a turning and anchorage basin immediately below the Western Maryland Railway Bridge, a distance of 1.0 mile.

(5) Northwest Branch:

(a) East Channel: A channel 950 feet wide and 39 feet deep for a distance of 1.0 mile.

(b) West Channel: A channel 650 feet wide and 35 feet deep, for a distance of 1.1 miles.

c. Anchorages with dimensions as follows:

(1) Riverview Anchorage No. 1: 35 feet deep, 4,500 feet long, and 1,500 feet wide.

(2) Riverview Anchorage No. 2: 30 feet deep, 2,400 feet long, and 1,300 feet wide.

(3) Fort McHenry Anchorage: 35 feet deep, 3,500 feet long, and 400 feet wide.

(4) Quarantine Anchorage: 35 feet deep, 3,500 feet long, and 600 feet wide.

AUTHORIZATION

2. The present Baltimore Harbor and Channels project modification was authorized by Section 101 of the River and Harbor Act, dated 31 December 1970, Public Law 91-611, which states in part:

> "The following works of improvement of rivers and harbors ... are hereby adopted and authorized to be prosecuted by the Secretary of the Army, acting through the Chief of Engineers, in accordance with the plans and subject to the conditions recommended by the Chief of Engineers in the respective reports hereinafter designated."

> "Baltimore Harbor and Channels, Maryland and Virginia: Chief of Engineers report dated September 1970, except that not to exceed $40,000,000 is authorized for initiation and partial accomplishment of such project, and except that construction shall not be initiated until approved by the Secretary of the Army and the President."

The modification consisted of deepening from 42 to 50 feet the Cape Henry Channel, York Spit Channel, Rappahannock Shoal Channel, Baltimore Harbor Approach Channels and the Curtis Bay Channel. Also, the Rappahannock Shoal Channel will be widened to 1,000 feet and the East and West channels of the Northwest Branch will be deepened to 49 feet and 40 feet respectively.

LOCAL COOPERATION

3. The Project Document stipulated that prior to construction of the modifications, local interests must agree to:

a. Provide without cost to the United States all lands, easements, and rights-of-way required for construction and subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of dredged material and necessary retaining dikes, bulkheads, and embankments therefor, or the costs of such retaining works;

b. Hold and save the United States free from damages that may result from the construction and maintenance of the project;

c. Provide and maintain at local expense adequate public terminal and transfer facilities open to all on equal terms, and depths in berthing areas and local access channels serving terminals commensurate with the depth provided in the related project areas;

d. Accomplish without cost to the United States such utility and other relocations or alterations as necessary for project purposes;

e. Prohibit erection of any structure within 125 feet of the project channel or turning basin; and

f. Establish regulations prohibiting discharge of pollutants into the waters of the channels and harbor by users thereof, which regulations shall be in accordance with applicable laws and regulations of Federal, State, and local authorities responsible for pollution prevention and control.

SECTION D

DESCRIPTION OF THE PORT

LOCATION

1. Baltimore Harbor is located on the Patapsco River and extends for a 10-mile reach upstream of the river's mouth. The Patapsco River originates near Westminister in Carroll County, Maryland, and flows southeasterly for 65 miles to enter Chesapeake Bay 9 miles below Fort McHenry. The lower 15 miles of the river are tidal. Upstream from the Hanover Street Bridge, the river is narrow and shallow and navigation is limited to barges and small craft. Immediately downstream from the Hanover Street Bridge the width of the river increases abruptly to about 1 mile. From this point to the mouth, the width increases gradually to about 4 miles. The river drains an area of 547 square miles.

2. The Port of Baltimore is 50 to 200 miles closer inland to the Midwest than any other North Atlantic port. The Midwest, commonly known as the heartland of the United States, accounts for almost one-half of the nation's industrial market. With many shipping expenses based on cost-per mile, Baltimore's geography gives it a distinct attractiveness to cost-conscious shippers. In addition, Baltimore can be approached from the sea by two distinct routes: from the south by the Virginia Capes and the Chesapeake Bay (150 miles), or from the north via the toll-free, sea-level Chesapeake and Delaware Canal (125 miles). The authorized plan and present condition of the southern route is described in Section E. The Chesapeake and Delaware Canal provides an authorized depth of 35 feet and width of 450 feet.

TRIBUTARY AREA

LOCAL TRIBUTARY AREA

3. Baltimore City encompasses an area of about 83 square miles of which 75 square miles are land and 8 square miles are water. The population of the city in 1970 was 905,759, a decrease of 3.5 percent from 1960. In 1970, the city was the seventh largest in the nation; whereas in both 1950 and 1960 the city ranked sixth. The Baltimore Metropolitan Area, as defined by the Bureau of Census, is comprised of Baltimore City and Baltimore, Carroll, Harford, Howard, and Anne Arundel Counties. In 1970, it was the eleventh largest Metropolitan Area in the nation, comprising an area of 2,259 square miles and having a population of 2,070,670. Although the metropolitan area was ranked twelfth in the nation in 1960, it did not consist of Harford County. The land area was 1,807 square miles and it contained 1,803,745 people.

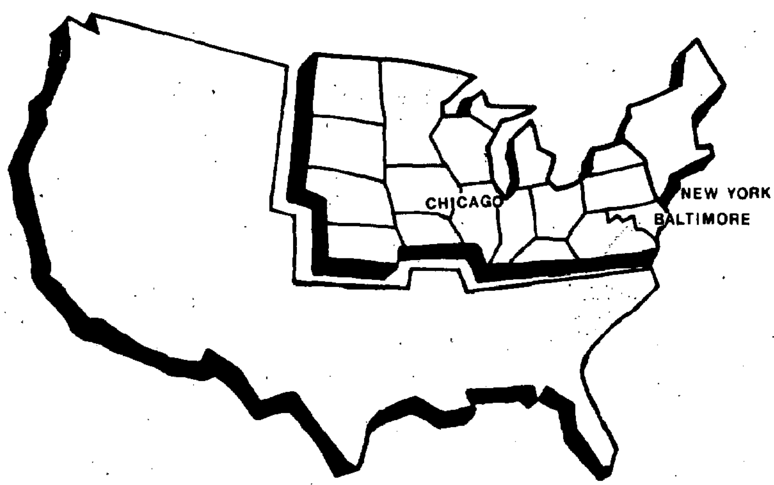
REGIONAL TRIBUTARY AREA

GENERAL

4. Because of low rail transportation rates and excellent railroad facilities, the area that can reasonably be considered tributary to Baltimore includes the states of Ohio, Indiana, Illinois, Iowa, North Dakota, South Dakota, Nebraska, Kansas, Wisconsin, Michigan, and Maryland, along with portions of New York, Kentucky, Delaware, Pennsylvania, Virginia, West Virginia, and Missouri. This regional tributary area, which is shown in Figure D-1, contains the large consuming centers of the Middle West and agricultural, commercial, and industrial activities of an important and widely diversified character. As mentioned earlier, Baltimore is 50 to 200 miles closer to the Midwest than other North Atlantic ports.

FIGURE D-1

REGIONAL TRIBUTARY AREA



TRANSPORTATION NETWORK SERVING THE PORT

5. The Baltimore region is linked by a modern highway system extending to most of the United States. Served by 160 registered interstate motor carriers offering every type of trucking service, Baltimore can provide overnight motor freight delivery to 37.2 percent of the United States industrial market and 31.4 percent of the United States population. The port's physical layout and road locations permit cargo to be routed quickly to and from piers. Carriers utilize the six-lane Baltimore Beltway system, which completely encircles the city, and the dual-tubed Baltimore Harbor Tunnel. Recently completed is the Francis Scott Key Bridge, a four-lane bridge serving as a second harbor crossing. The Beltway, the Harbor Tunnel, and new bridge connect with Interstate 95 North and South, 70 West, and 83 North, linking with the Pennsylvania Turnpike, Ohio Turnpike, New Jersey Turnpike, and Route 40 East and West. A new 8-lane tunnel is being constructed under the Northwest Branch Channel which will complete the I-95 link in the state.

6. The Port of Baltimore is served by three major trunk line railroads: the Chessie System (Chesapeake and Ohio/Baltimore and Ohio), Consolidated Railroad Corporation (ConRail), and the Western Maryland Railway. The three railroads provide service to and from the port to the North, South, and Midwest, with first day rail delivery to 43.7 percent of the United States industrial market and 36.6 percent of the population.

PORT FACILITIES

7. Baltimore is the second largest container handling port on the United States Atlantic and Gulf Coasts, after New York. Its specialized and bulk cargo handling facilities have become among the most modern in the world, and in recent years, the port's marine terminals have handled more than 38 million tons of foreign cargo in a single year. The port's overall annual commerce, both foreign and domestic, has averaged nearly 50 million tons during the past decade.

8. Baltimore Harbor comprises roughly 45 miles of waterfront area surrounding nearly 1,600 acres of sheltered waters and anchorages. The more than 100 covered and open piers makes berthing readily and easily accessible at all times and allows 5 million cubic feet of cold storage area. Additionally, there is ground storage available equivalent to 53,700 railroad cars of cargo. Ore unloading (import) and coal loading (export) at the port's three facilities total 7,000 tons per hour and 14,500 tons an hour, respectively. The port's three grain elevators have a combined storage capacity of nearly 13 million bushels, which they can load at the rate of 170,000 bushels every hour.

SECTION E

AUTHORIZED PLAN

DESCRIPTION

1. The authorized modification for Baltimore Harbor and Channels, as shown in Figures E-1 through E-5, provides for:

a. Deepening the Cape Henry Channel from 42 feet to 50 feet and extension to 50-foot depth curves.

b. Deepening the York Spit Channel from 42 feet to 50 feet and extension to 50-foot depth curves.

c. Deepening the Rappahannock Shoal Channel from 42 feet to 50 feet, widening from 800 feet to 1,000 feet, and extension to 50-foot depth curves.

d. Deepening the Main Ship Channel from 42 feet to 50 feet and extension to 50-foot depth curve.

e. Deepening the Curtis Bay Channel from 42 feet to 50 feet.

f. Deepening the Northwest Branch - East Channel to 49 feet deep and widening to 600 feet, with a turning basin at the head of the channel from that depth existing at the time of construction.

g. Deepening the Northwest Branch - West Channel to 40 feet deep and widening to 600 feet, with a turning basin at the head of the channel from that depth existing at the time of construction.

PRESENT CONDITION

2. To determine dredging quantities, condition surveys were made in 1977 of the Maryland and Virginia Channels by the Baltimore and Norfolk Districts, respectively. Those surveys and other more recent after dredging surveys were used to update the project status of the project and are reflected in Table E-1.

TABLE E-1

STATUS OF EXISTING PROJECT

Channel	Depth (feet) Inbound	Outbound	Authorized	Width 1/ (feet)	Year Ascertained
Cape Henry Channel	43.9	42.0	50.0	1,000	1977
York Spit Channel	42.0	42.3	50.0	1,000	1977
Rappahannock Shoal Channel	44.7	43.6	50.0	800 2/	1977
Craighill Entrance	41.6	39.7	50.0	1,715	1980
Craighill Section	40.1	40.5	50.0	800	1980
Craighill-Cutoff Angle	40.7	42.0	50.0	1,950	1981
Cutoff Section	42.5	42.9	50.0	800	1980
Cutoff-Brewerton Angle	36.1	42.0	50.0	1,750	1981
Brewerton Section	38.8	39.1	50.0	800	1980
Brewerton-Fort McHenry Angle	37.8	36.2	50.0	1,445	1980
Fort McHenry Section	38.3	39.6	50.0	800	1980
Northwest Branch (Inner Harbor):					
East Side Channel	33.3	36.9	49.0	950 3/	1980
West Side Channel	34.4	34.9	40.0	650 3/	1980
Turning Basin	23.0	25.0	40.0	950-1,200	1980
Curtis Bay	36.2	36.3	50.0	600	1981
Ferry Bar (East Section)	37.0	38.2	42.0	600	1979
Ferry Bar (West Section)	19.0	19.0	35.0	170	1960
Spring Garden (Ferry Bar to Hanover Street Bridge)	22.0	22.0	27.0	180	1960
Spring Garden (to Old Southwest Baltimore Channel)	9.5		—	250	1938
Approach Channels to the Inland Waterway from Delaware River to Chesapeake Bay					
Connecting Channel	26.4	28.1	35.0	400 4/	1980
Swan Point Channel	35.0	35.0	35.0	600	1981
Tolchester Channel	35.0	35.0	35.0	600	1981
Fort McHenry Anchorage	31.7	30.3	35.0	400	1980
Riverview Anchorage No. 1	31.0	32.9	35.0	1,500	1980
Riverview Anchorage No. 2	27.1	31.3	30.0	1,200	1980
Curtis Creek:					
Main Channel	26.0	26.0	35.0	200	1966
Approach Channel to Ordinance Depot	18.8	18.2	22.0	200	1964

TABLE E-1 (continued)

Channel	Depth (feet) Inbound	Outbound	Authorized	Width 1/ (feet)	Year Ascertained
Southerly Anchorage Area		15.5	15.0	450	1941
Easterly Anchorage Area		18.2	18.0	320	1941
Channel to Arundel Cove	18.2	21.2	22.0	200	1966
Channel in Arundel Cove	16.1	21.5	22.0	100	1966
Anchorage Basin in front of Coast Guard Depot		20.0	22.0	700	1966

1/ All channel widths to remain the same unless otherwise noted.
2/ Authorized widening to 1,000 feet.
3/ Authorized depths for 600 foot width only.
4/ Authorized to a width of 600 feet.

CORPS OF ENGINEERS

U. S. ARMY

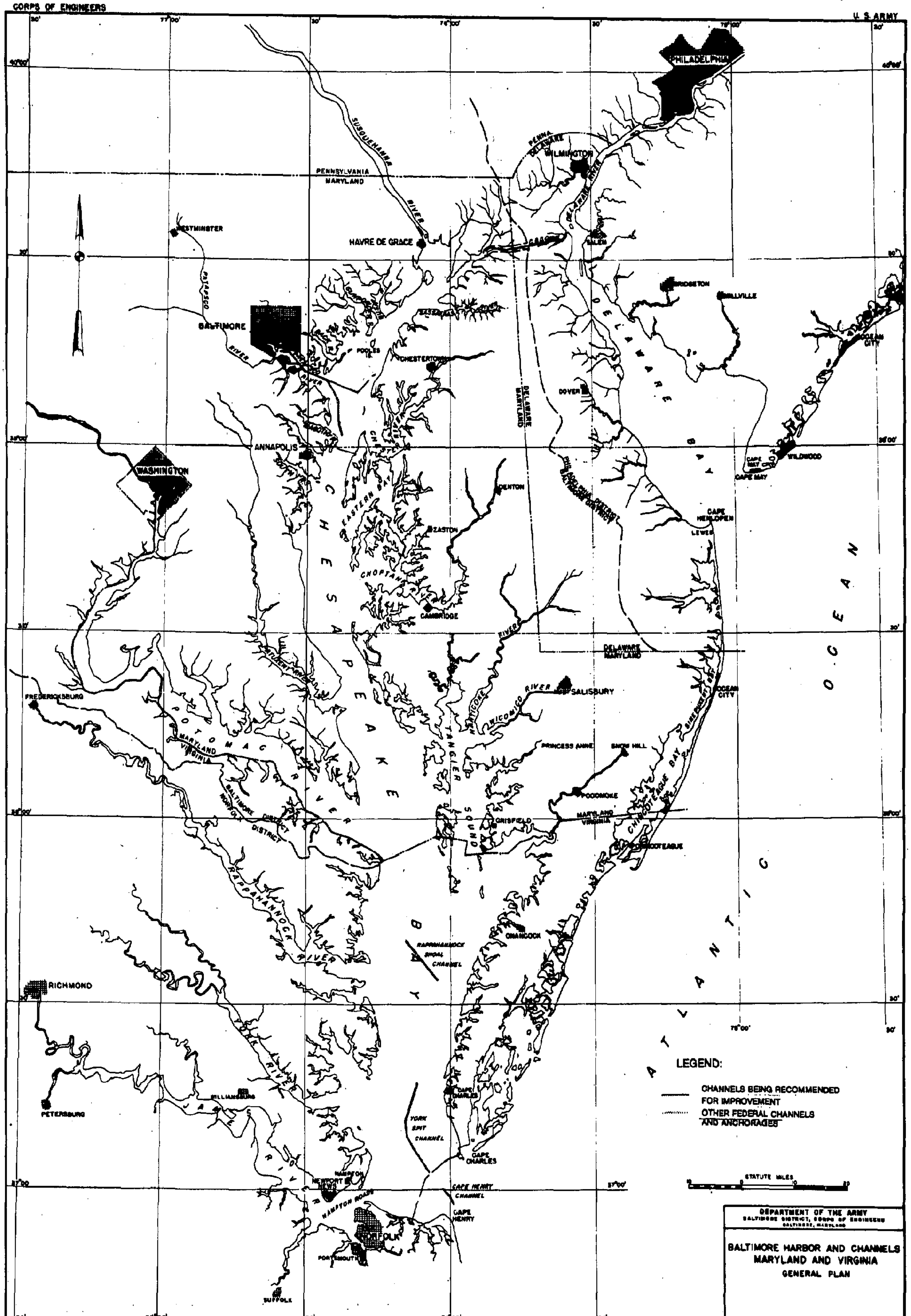


Figure E-1

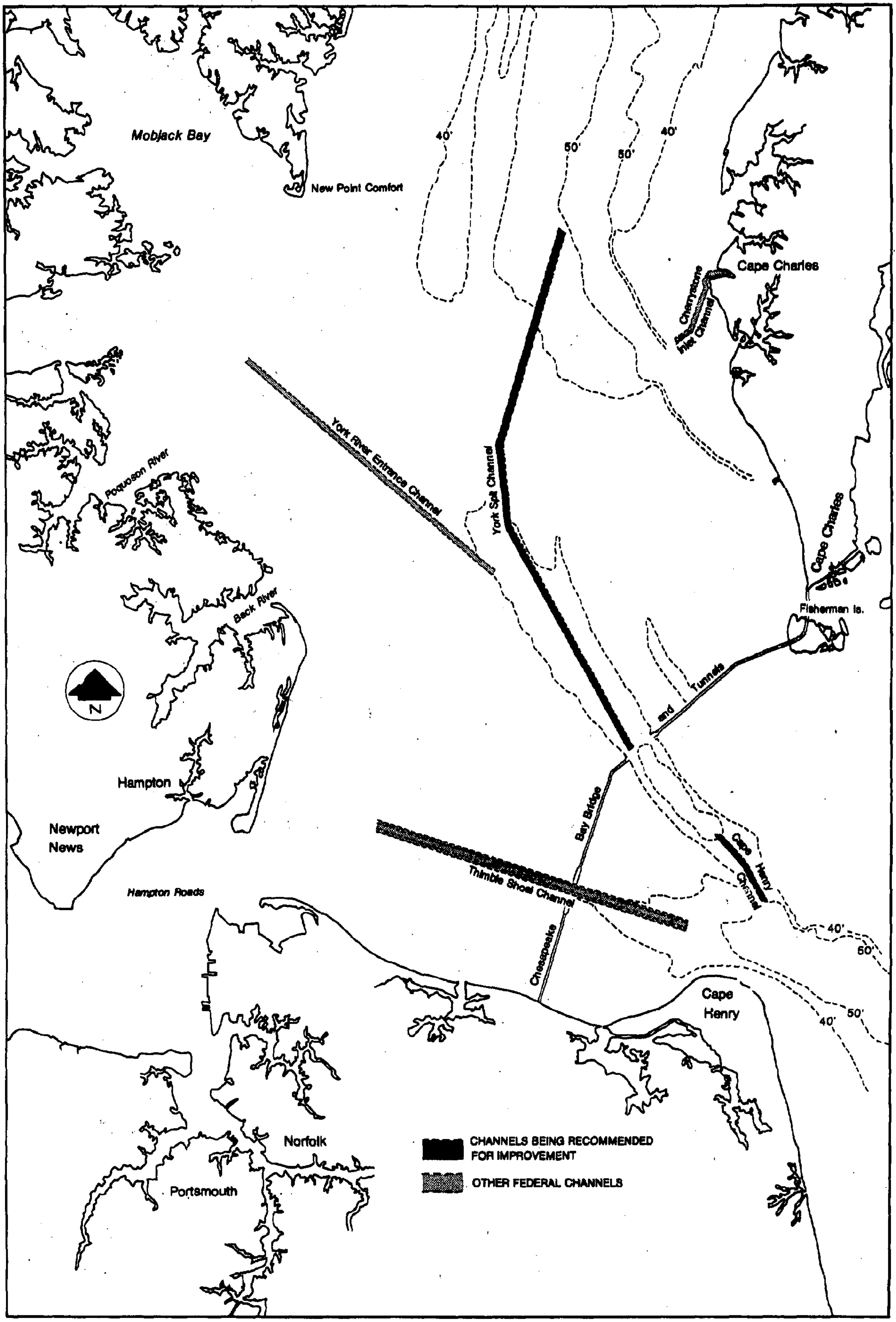

Mobjack Bay
New Point Comfort
40'
50'
50'
40'
Cape Charles
Cherrystone Inlet Channel
York River Entrance Channel
York Spit Channel
Poquoson River
Cape Charles
Fisherman Is.
Back River
and Tunnels
N
Hampton
Newport News
Bay Bridge
Cape Henry Channel
Hampton Roads
Thimble Shoal Channel
Chesapeake
40'
60'
Cape Henry
50'
40'
CHANNELS BEING RECOMMENDED FOR IMPROVEMENT
OTHER FEDERAL CHANNELS
Norfolk
Portsmouth

Figure E-2

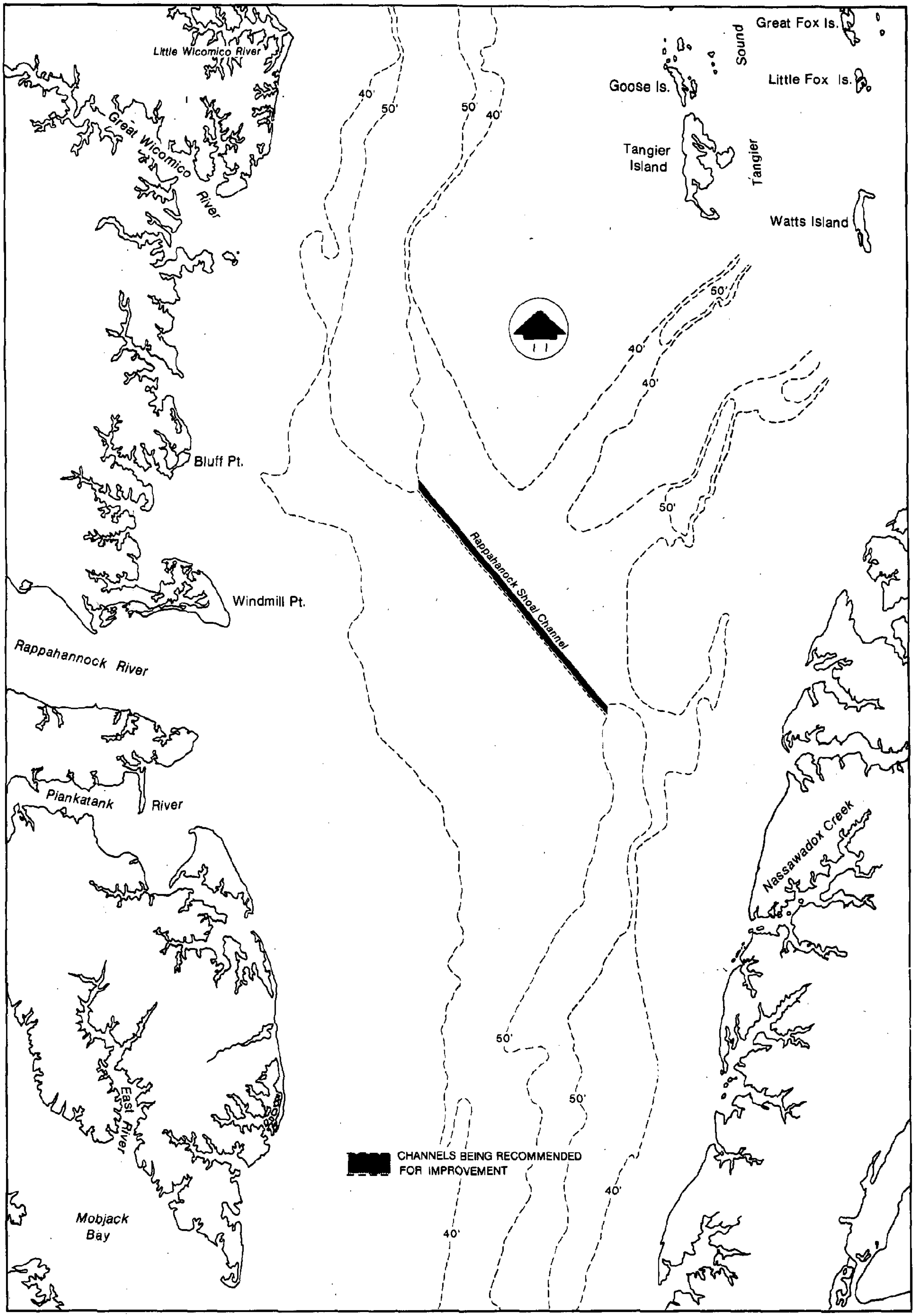

Little Wicomico River
Great Wicomico River
Bluff Pt.
Windmill Pt.
Rappahannock River
Piankatank River
East River
Mobjack Bay
Great Fox Is.
Sound
Goose Is.
Little Fox Is.
Tangier Island
Tangier
Watts Island
Nassawadox Creek
Rappahannock Shoal Channel
40'
50'
CHANNELS BEING RECOMMENDED FOR IMPROVEMENT

Figure E-3

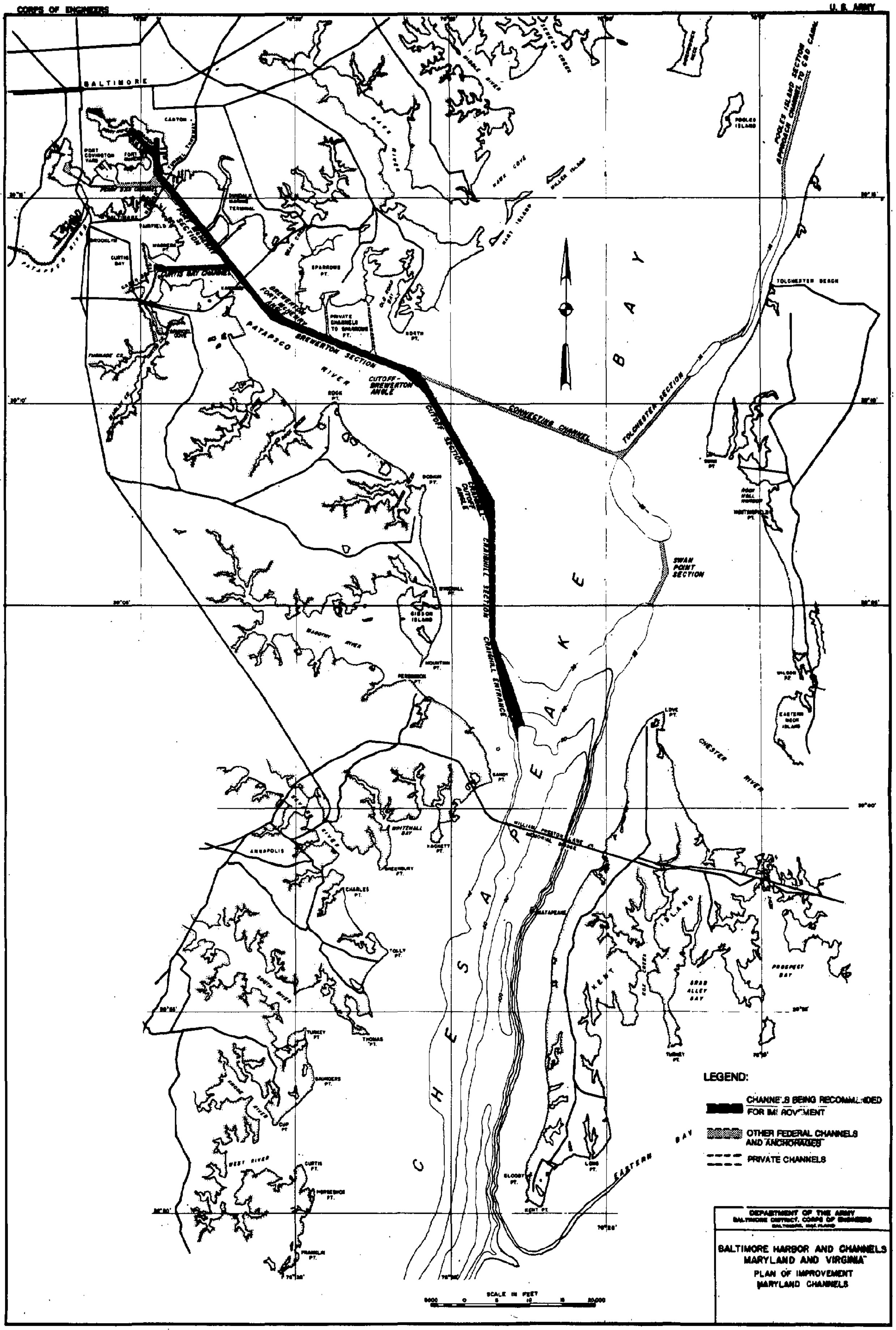
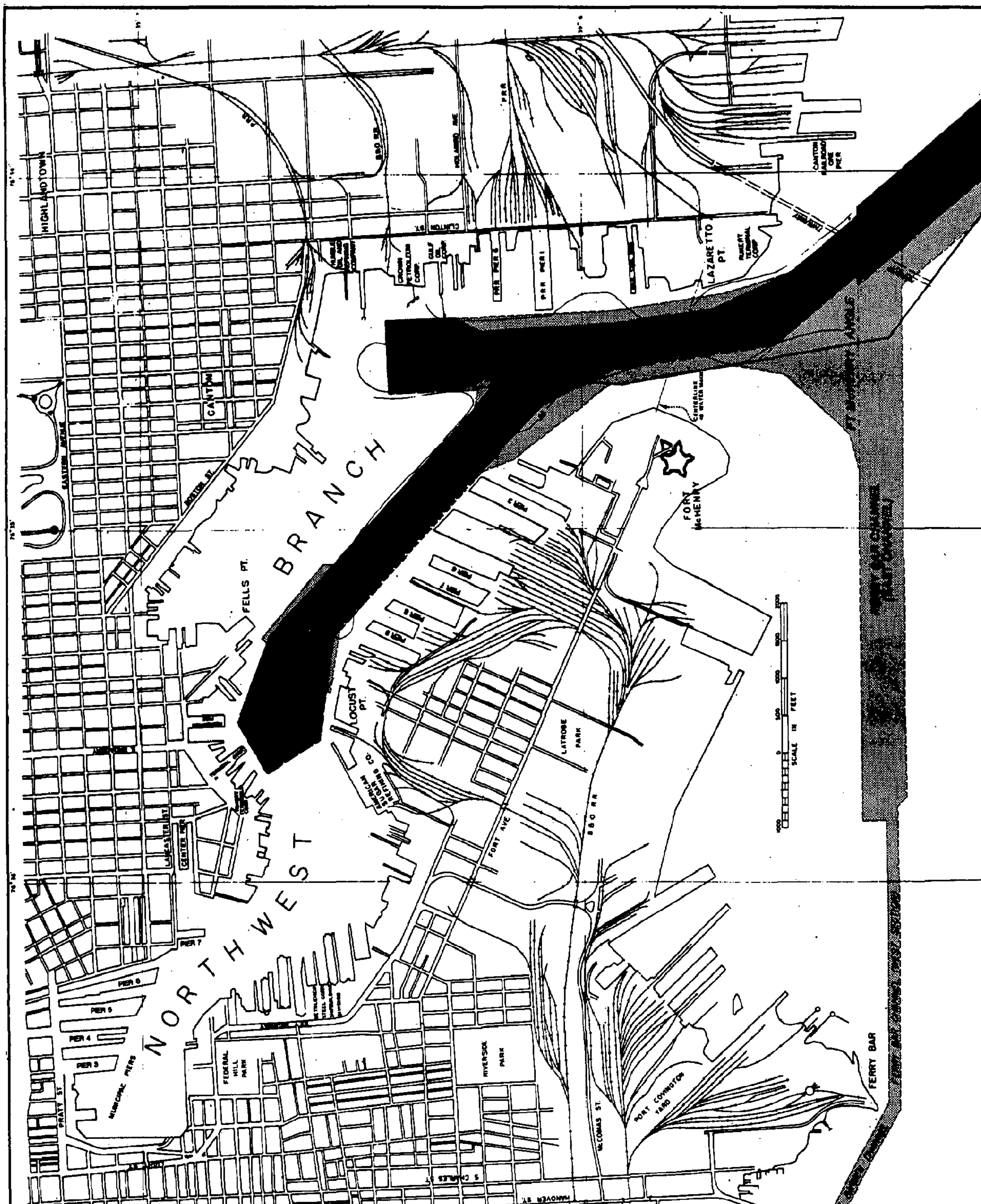

CORPS OF ENGINEERS
U.S. ARMY
BALTIMORE
PATAPSCO RIVER
CURTIS BAY CHANNEL
BREWERTON SECTION
CUTOFF-BREWERTON ANGLE
CUTOFF SECTION
CONNECTING CHANNEL
TOLCHESTER SECTION
POOLE'S ISLAND SECTION APPROACH CHANNEL TO C&D CANAL
TOLCHESTER BEACH
SWAN POINT SECTION
CRAIGHILL SECTION
CRAIGHILL ENTRANCE
SPARROWS PT.
GIBSON ISLAND
MAGOTHY RIVER
ANNAPOLIS
SEVERN RIVER
SOUTH RIVER
WEST RIVER
CHESTER RIVER
KENT ISLAND
EASTERN BAY
CHESAPEAKE BAY
LEGEND:
OTHER FEDERAL CHANNELS AND ANCHORAGES
PRIVATE CHANNELS
DEPARTMENT OF THE ARMY
BALTIMORE HARBOR AND CHANNELS
MARYLAND AND VIRGINIA
PLAN OF IMPROVEMENT
MARYLAND CHANNELS
SCALE IN FEET

Figure E-4



RECOMMENDED IMPROVEMENT
NORTHWEST BRANCH

EAST CHANNEL, 600' WIDE AND 49' DEEP.
WEST CHANNEL, 600' WIDE AND 40' DEEP.

LEGEND

CHANNELS BEING RECOMMENDED FOR IMPROVEMENT
OTHER FEDERAL CHANNELS AND ANCHORAGES
PROPOSED REALIGNMENT

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND

BALTIMORE HARBOR AND CHANNELS
MARYLAND AND VIRGINIA
PLAN OF IMPROVEMENT
NORTHWEST BRANCH

Figure E-5

SECTION F

CURRENT NEED AND DEVELOPMENT OBJECTIVES

INTRODUCTION

1. The rapid growth of international bulk trade during the past two decades and the concurrent expansion of the world bulk fleet, both in terms of number of vessels and their size, have led to a considerable expansion and improvement of port facilities worldwide. Most of this development has been directed towards providing deep water and cargo handling facilities to accommodate large bulk carriers safely and efficiently, such vessels offering the most efficient means of transporting large volumes of commodities. Over seventy 100,000 + deadweight ton (DWT) terminals were scheduled to become operational before 1980. With current depth restrictions at Baltimore Harbor, the larger bulk carriers calling on the port in increasing numbers every year cannot load to their capacity, making water transportation of Baltimore Harbor relatively inefficient. As Baltimore Harbor is primarily a bulk cargo port, economical water transportation afforded by deep shipping channels is paramount in keeping Baltimore active and competitive with other United States and World ports.

PORT COMMERCE

EXISTING COMMERCE

2. Baltimore Harbor has historically ranked as one of the leading ports in the Nation and the World both in terms of tonnage and dollar value. Baltimore conducts trade with about 300 different ports located in 125 countries. In 1978, Baltimore's overall commerce total of 46,809,090 tons ranked in the top ten in the United States. Baltimore is primarily a foreign trade port. Imports and exports in 1978 totalled 31,846,630 tons, equal to 68 percent of the total port tonnage moved and represented 3.7 and 13.9 percent, respectively, of total United States and North Atlantic foreign trade. This foreign trade volume ranked Baltimore sixth in the United States in tonnage and third in cargo value. Baltimore's import volume of 17,507,549 tons ranked seventh in the Nation; exports totalling 14,399,081 ranked fifth. Table F-1 presents a comparison of foreign and domestic commerce over the last decade.

Table F-1

BALTIMORE HARBOR WATERBORNE COMMERCE
1969-1978 (thousands short tons)

	Imports	Exports	Total Foreign	Domestic	Total
1969	19,363	5,940	25,303	18,614	43,917
1970	20,480	9,375	29,855	21,229	51,084
1971	18,282	6,475	24,757	19,246	44,003
1972	18,443	8,177	26,620	19,179	45,799
1973	21,022	10,322	31,344	22,443	53,787
1974	25,231	12,876	38,107	21,784	59,891
1975	20,657	13,859	34,516	18,145	52,661
1976	18,035	14,945	32,980	19,457	53,437
1977	14,101	14,040	28,141	16,615	44,756
1978	17,508	14,339	31,847	14,962	46,809

Source: Waterborne Commerce of the United States.

3. Bulk cargo continues to form the mainstay of Baltimore's cargo business, increasing by more than 200 percent since 1945. In 1978, bulk cargo accounted for 82 percent of the overall commerce and 82 percent of the port's foreign commerce. The commerce in 1978 by classes of commodities is shown in Table F-2. As can be seen, ores, coal, and petroleum products are the major bulk classes with manufactured products leading in the general cargo category. More detailed information on bulk cargo is presented in Section P, "Benefits".

PROSPECTIVE COMMERCE

4. Detailed investigations have been made of the prospective commerce at the Port of Baltimore for those commodities which move in deep-draft vessels and are likely to benefit in transportation savings from further deepening of the shipping channels. Existing tonnage figures have been projected to year 1986, the first year the project is estimated to become fully operational, and then over the 50-year project economic life. The results of these investigations are shown in Table F-3 and discussed briefly below for each commodity. Detailed discussions and considerations in making those projections are presented in Section P, "Benefits".

TABLE F-2

BALTIMORE HARBOR COMMERCE, 1978 - BY COMMODITY CLASSIFICATION
(Short Tons)

		FOREIGN		COASTWISE		INTERNAL		
	TOTAL	IMPORTS	EXPORTS	RECEIPTS	SHIPMENTS	RECEIPTS	SHIPMENTS	LOCAL
BULK								
Ores	8,078,238	7,908,746	143,682	—	15	5,017	20,778	—
Coal	8,569,305	80	5,887,337	437	23	968,935	345,027	1,367,466
Petroleum & Products	13,733,719	4,366,074	52,974	3,692,935	41,207	1,915,107	885,037	2,780,385
Grains	5,785,487	2,673	5,685,800	2,648	91,866	2,500	—	--
Sugar	500,120	472,591	147	25,991	1,391	--	—	--
Other Bulk	1,682,584	1,535,808	22,906	44,838	3,311	39,002	33,454	3,265
Total Bulk	38,349,453	19,285,972	11,792,846	3,766,849	137,813	2,930,561	1,284,296	4,151,116
GENERAL CARGO								
Farm & Farm Products	1,340,740	519,386	469,069	76,256	158,808	116,884	337	—
Non-Metallic Minerals	312,652	243,412	21,409	46,490	1,341	—	--	--
Textiles	73,770	40,166	23,216	4,757	3,411	116	2,104	--
Forest Products	815,505	509,717	256,830	4,268	39,888	3,236	1,566	--
Chemicals	1,126,926	182,278	307,631	100,610	100,749	190,019	71,432	174,207
Manufactured Products	3,668,942	1,674,846	1,331,424	367,905	194,711	13,966	193,244	307
Miscellaneous	1,121,102	51,772	136,656	17,805	206,276	260,665	276,053	64,414
Total General Cargo	8,459,637	3,221,577	2,546,235	618,091	705,184	584,886	544,736	238,928
TOTAL	46,809,090	17,507,549	14,339,081	4,384,940	842,997	3,515,447	1,829,032	4,390,044

Source: Waterborne Commerce of the United States

TABLE F-3

BALTIMORE HARBOR
PROSPECTIVE DEEP DRAFT COMMERCE
(1,000 short tons)

Commodity	Movement 1/	Existing 2/	1986	2000	2036
Iron Ore	I	11,903	9,200	9,200	9,200
Residual Fuel 3/	I	1,640	1,830	2,050	850
Coal	E	6,424	38,000	54,800	54,800
Grain	E	4,870	5,470	6,420	9,760
Sugar	I	616	650	700	780
TOTAL		25,453	55,150	73,170	75,390

1/ I=Import; E=Export
2/ 1974-1976 Average
3/ Northwest Branch - East Channel only

IRON ORE

5. Iron ore imports into Baltimore for local consumption and for transshipment inland is projected to decline from the 1976 volume of 10.3 million tons to 9.2 million tons in the base year, 1986. Thereafter, volumes will remain constant. If, however, Baltimore Harbor were deepened to 50 feet, the transportation savings realized may cause an estimated 2 million tons of iron ore to be diverted from Philadelphia to Baltimore for transshipment inland.

RESIDUAL FUEL

6. Whereas significant volumes of petroleum are received at numerous terminals throughout the harbor, only residual fuel oil receipts at the terminal in the Northwest Branch will likely be transported in deep draft vessels requiring a depth greater than 42 feet. Therefore, only these receipts are projected. Volumes received at this terminal are expected to increase from approximately 1.38 million tons in 1976 to 2.05 million tons in the year 2000 and declining thereafter to an estimated 850,000 tons in 2036.

COAL

7. Coal exports from Baltimore Harbor are projected to grow from 6.5 million tons in 1976 to 38 million tons in 1986, the base year, and to 54.8 million tons in year 2000. For the remainder of the project life, no growth in exports is projected because of major uncertainties in the world and United States energy situation and steel making demand. The dramatic increases projected are as a result primarily of recent and anticipated future conversions by European utilities from oil to coal as the fuel in their electricity generating plants.

GRAIN

8. Projections of grain exports from Baltimore are based on projected increases in population and per capita income throughout the world. Export totals are projected to increase from about 5 million to 9.76 million tons by year 2036, an indicated annual growth rate of 1.15 percent.

SUGAR

9. Raw sugar receipts at Baltimore are related to population in the market area for the refined sugar. Based on population projections for the market area, total receipts are projected to increase from 600,000 tons in 1976 to 780,000 tons in 2036, an overall growth of 30 percent or an average of about 0.5 percent annually.

DIFFICULTIES ATTENDING NAVIGATION

10. The water depths in the ship channels in and leading to Baltimore Harbor are presently inadequate to accommodate the existing and future large bulk cargo carriers in the world fleet. Even now a significant number of vessels in Baltimore Harbor's major bulk trades cannot load to capacity due to the 42-foot water depth restrictions. This situation is likely to worsen in the future as volumes of commerce at Baltimore and ship sizes in the world fleet increase. Presently, 50,000 deadweight tons is the approximate maximum ship size able to fully load on the 42-foot channels. This size ship corresponds to a fully loaded draft of 40 feet saltwater. Whereas 5 feet is the minimum recommended keel clearance for safety, many vessel operators regularly leave only two feet under the keel in order to load more fully. The problem of inadequate channel depths at Baltimore is compounded by the fact that Baltimore Harbor is mainly freshwater, which is less buoyant than seawater. As a result, a vessel drawing 40 feet in the ocean or lower bay would draw approximately 41 feet at Baltimore. As the mean range of tide at Baltimore is only 1 foot, there is little to be gained by waiting for and navigating on high tide.

VESSEL TRAFFIC

EXISTING TRAFFIC

11. The foreign commerce of Baltimore Harbor, a mix of bulk, general, and specialized cargoes, is transported by an average of more than 4,000 ships annually, or about 11 a day. Tables F-4 and F-5, respectively, show dry cargo and tanker trips by draft at Baltimore for the past decade. Whereas the number of trips has remained fairly constant, the increasing commerce is being transported in vessels of deeper draft. Vessels in the ore, coal, petroleum, and grain trades comprise the majority of the vessels with drafts greater than 30 feet. In addition, general cargo vessels may have drafts up to 35 feet. As can be noted from the table, the number of vessels drawing 37 feet and greater has been increasing steadily. Considering that Baltimore Harbor presently has a design depth of 42 feet, more and more vessels are exceeding the recommended safety limits of the channel.

TABLE F-4
BALTIMORE HARBOR AND CHANNELS
TRIPS AND DRAFTS OF VESSELS 1/
(Passenger and Dry Cargo)

ACTUAL DRAFT (feet)	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
42+					2	2	1			
41			1	4	4	17	4	1	2	1
40	47	76	81	103	101	119	106	122	64	87
39	73	69	25	33	44	55	64	25	24	54
38	39	28	25	13	25	43	36	39	37	20
37	32	29	35	22	27	28	35	61	37	29
36	16	38	32	32	35	40	51	72	78	81
35	46	50	61	32	46	94	50	75	66	65
34	52	44	48	39	75	86	51	63	62	69
33	44	84	45	75	111	143	75	77	87	88
32	67	88	100	109	146	221	115	151	149	155
31	63	119	123	151	220	249	117	150	135	152
30 & less	11,369	14,361	11,016	13,004	12,895	14,083	14,413	11,840	13,562	8,206
TOTAL	11,848	14,986	11,592	13,617	13,731	15,180	15,118	12,676	14,303	9,007

1/ Includes both inbound and outbound traffic; self-propelled vessels only.

TABLE F-5
BALTIMORE HARBOR AND CHANNELS
TRIPS AND DRAFTS OF VESSELS 1/
(Tankers)

ACTUAL DRAFT (feet)	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
42						2				
41				2	1	2	1	1		2
40	3	2		4	4	16	17	18	20	19
39	3	18	16	37	48	47	31	37	27	24
38	10	33	22	22	25	28	18	35	31	26
37	18	29	33	35	44	18	22	28	18	28
36	20	28	23	24	18	16	19	13	23	38
35	24	27	33	19	15	12	12	15	23	29
34	39	44	38	32	38	29	16	16	30	30
33	29	26	26	30	46	39	13	23	38	21
32	65	59	59	42	43	51	34	17	20	17
31	52	45	29	41	35	28	43	36	19	12
30 & less	1,589	1,981	1,784	1,568	1,482	1,613	1,162	1,525	1,789	1,783
TOTAL	1,852	2,292	2,063	1,856	1,799	1,901	1,388	1,764	2,038	2,029

1/ Includes both inbound and outbound traffic; self-propelled vessels only.

12. The largest vessel calling at Baltimore Harbor in 1975-76 was a 160,000 deadweight ton combined ore/oil carrier, the "M.S. Yemanja." However, as Table F-6 shows, only 36 of the 1,136 vessel trips in the major dry bulk trades were larger than 80,000 DWT. Nearly half of the vessel trips in the three major dry bulk trades were greater than 50,000 DWT, requiring some light-loading to navigate the 42 foot channels. Table F-7 presents typical dimensions of the range of dry and liquid bulk vessels expected to use the port.

TABLE F-6
BALTIMORE HARBOR
MAJOR DRY BULK MOVEMENTS
1975 & 1976
(number of trips)

DWT (000's)	Iron Ore Imports	Coal Exports	Grain Exports	Total
Under 30	37	59	216	312
30 - 40	27	56	87	140
40 - 50	69	29	39	137
50 - 60	165	82	24	271
60 - 70	63	71	11	5
70 - 80	36	54	5	95
80 - 90	5	5	6	16
90 - 100	1	0	1	2
100 - 150	6	5	4	15
150 +	3	0	0	3
TOTALS	412	361	393	1,136

PROSPECTIVE TRAFFIC

13. Because of the transportation efficiencies associated with using the larger, deep draft specialized vessels, it is expected that more and more of these larger ships will enter Baltimore Harbor in future years. Port interests have indicated that if the Baltimore Harbor and channels were deepened to 50 feet, this trend towards larger vessels will be accentuated. By analyzing data on the existing bulk carrier and tanker fleet composition, and data supplied by local shippers, projections were made as to the composition of the future dry bulk and liquid bulk fleet at Baltimore. The future fleet is expected to range from less than 20,000 DWT to over 150,000 DWT in the three major dry bulk trades: iron ore, coal, and grain. Ship sizes in the petroleum trades will range up to 90,000 DWT. More detailed discussions of existing and prospective fleets is presented in Section P, "Benefits".

TABLE F-7
BALTIMORE HARBOR
TYPICAL VESSEL DIMENSIONS

DWT	Length (ft.)	Beam (ft.)	Maximum Draft (ft.)	Speed (knots)
		DRY BULK		
15,000	521	69	29'0"	14.0
25,000	582	79	33'0"	14.8
35,000	631	87	36'0"	15.1
50,000	693	98	40'0"	15.2
60,000	729	104	42'0"	15.5
80,000	793	115	46'0"	15.5
100,000	850	124	49'0"	15.5
120,000	901	133	52'0"	15.5
150,000	970	145	57'0"	15.5
		TANKERS		
20,000	557	72	31'0"	16.5
25,000	587	84	32'6"	16.5
37,000	660	90	36'0"	16.5
50,000	740	102	39'6"	16.5
60,000	775	106	40'6"	16.25
70,000	800	116	42'0"	16.25
80,000	811	122	43'6"	16.25
90,000	820	122	46'0"	16.0

14. There has evolved much concern from local shipping interests over the depth inadequacies of the Baltimore Harbor and the approach channels and the resultant inability to accommodate the larger, more efficient vessels in the world fleet. It is feared that Baltimore Harbor's increasing transportation inefficiencies will eventually result in the loss of commerce to other United States and world ports. Of primary importance is the effect of a deeper shipping channel in keeping Bethlehem Steel products competitive in U.S. and world markets as well as keeping United States mined coal competitive in the export market. Because all major industries in the Baltimore area are either partially or completely dependent upon the port, loss of shipping business would have significant adverse effects on the local economic base in the form of loss of jobs, income, and tax revenues from these firms. Similar effects would occur for shipping-related businesses such as steamship agents, freight forwarders, stevedores, brokerage firms, railroads, and trucking services. A study by the University of Maryland concluded that the port of Baltimore is Maryland's single most important economic asset, having a total annual impact of more than $2.5 billion, about 10 percent of the Gross State Product. It was determined that the port is directly responsible for nearly 170,000 jobs and $317 million in state and local taxes. Even with the recent and planned expansions and upgrading of shipping facilities and industries around the port, it is felt by many that the Port of Baltimore will suffer substantially from commerce loss if the proposed project is not accomplished.

SECTION G

ALTERNATIVES

1. The Project Document investigations dealt with the feasibility of various channel depths and widths, and recommended the following channel dimensions.

a. Cape Henry Channel - 50 foot depth; 1,000 feet wide.

b. York Spit Channel - 50 foot depth; 1,000 feet wide.

c. Rappahannock Shoal Channel - 50 foot depth; 1,000 feet wide.

d. Main Ship Channel - 50 foot depth; 800 feet wide.

e. Curtis Bay Channel - 50 foot depth; 600 feet wide.

f. Northwest Branch - East Channel - 49 foot depth; 600 feet wide.

g. Northwest Branch-West Channel - 40 foot depth; 600 feet wide.

2. This report is an affirmation study of the previous conclusions rather than reformulation report considering new or altered solutions to the problem. There are no viable alternate solutions to the channel deepening that would meet the existing and prospective needs of navigation. No action would mean that the Port of Baltimore's ability to accommodate large ships could reduce the economic efficiency of the port and the region. The only alternatives considered in this report are those involved with disposal of the dredged material.

SECTION H

INVESTIGATIONS

PROJECT DOCUMENT INVESTIGATIONS

HYDROGRAPHIC SURVEYS

1. No hydrographic surveys were conducted specifically for the Project Document. The dredging quantitites for deepening the existing channels to 50 feet were estimated using existing condition surveys conducted between 1961-1969 in conjunction with the 42-foot project. The quantities involved with the channel extensions in deepening from a 42-foot channel to a 50-foot channel were estimated using National Oceanic Survey coast charts, circa 1966.

SUBSURFACE EXPLORATIONS

2. Foundation information for the Project Document was taken from 40 drive spoon penetration borings which were drilled to 50 feet mlw in support of the construction of the 42-foot channel. The subsurface information was limited to the Maryland channels. Since Government hopper dredges constructed the Virginia channels, subsurface investigation was not undertaken in the Virginia channels for the Project Document investigations. However, subsurface exploration information is available subsequent to the Project Document Investigation. For further information concerning soil consistency and hardness of various materials refer to paragraphs 10 through 15 in this section.

UTILITY INVESTIGATION

3. Minimum utility investigations were conducted in support of the Project Document. A 48-inch water line under the Northwest Branch Channel was identified as the only utility requiring relocation.

ECONOMIC STUDIES

4. Economic studies were undertaken for the Project Document to determine potential transportation savings to shippers resulting from the use of larger, deeper-draft vessels in the ore, coal, petroleum, sugar, and general cargo trades. Benefits and costs were calculated for deepening to channel depths ranging from 42 to 50 feet in the main ship channels and the Curtis Bay Channel, from 35 to 50 feet in the Northwest Branch-East Channel, and from 28 to 40 feet in the Northwest Branch-West Channel. Commodity projections, fleet size projections, and unit transportation cost analyses were made for each commodity, country, and channel depth under study to determine total transportation savings. Table H-1 presents the future commerce projections made for the major bulk commodities. Iron ore, projected to nearly in volume by year 2025, made up over half of all Baltimore Harbor deep-draft commerce. The future fleet was projected to comprise of vessels ranging from 20,000 to 100,000 DWT in the major bulk trades.

5. Table H-2 presents the summary of the incremental economic analysis for the main channels and the Northwest Branch channels prepared for the Project Document. New benefits for deepening the main channels, including the Northwest Branch-East Channel, from 42 feet were maximized between 49 and 50 feet. Fifty feet was the selected optimum depth, with a corresponding benefit-cost ratio of 1.26 to 1. Net benefits from deepening the Northwest Branch-West Channel from 28 feet were maximized to 40 feet, with a corresponding benefit-cost ratio of 26.9 to 1.

6. The July 1974 Supplement to the Project Document, Baltimore Harbor and Channels Review Report, prepared at the request of the Office of Management and Budget, presented an updated economic analysis for the deepening to 50 feet and evaluated the feasibility of deepening only the inbound portion of the channels to 50 feet. Dredging costs were updated to 1973 price levels and evaluated at 5-5/8 percent interest rate. Benefits were updated to 1972 price levels using the latest available vessel operating costs. The commodity projections and fleet size projections from the Project Document were considered still valid. Table H-3 presents a summary of the results of the economic studies. The project justification increased from that presented in the Project Document due to the dramatic increases in foreign vessel operating costs since 1969. Although the inbound-only channel was found to have a higher benefit-cost ratio, the 50-foot inbound and outbound channel with a benefit-cost ratio of 1.94 to 1 was recommended due to safety reasons.

PUBLIC INVOLVEMENT

7. The Project Document was fully coordinated with concerned Federal, State, and local agencies and local interests. The primary agencies and local interests which were coordinated with during the penetration and review of the Project Document were: United States Coast Guard, Fish and Wildlife Service, State of Maryland, Commonwealth of Virginia, Public Health Service, Federal Water Pollution Control Administration (now EPA), Association of Maryland Pilots, Baltimore Maritime Exchange, Baltimore and Ohio Railroad Company, R.C. Heard afe Service, State of Maryland, Commonwealth of Virginia, Public Health Service, Federal Water Pollution Control Administration (now EPA), Association of Maryland Pilots, Baltimore Maritime Exchange, Baltimore and Ohio Railroad Company, R.C. Heard and Company, John S. Connor, Inc., Bethlehem Steel Corporation, Steamship Trade Association of Baltimore, and Exxon Company, USA.

8. A public meeting was held in Baltimore, Maryland, on 25 May 1966. The meeting was attended by 55 persons including representatives of Federal and State governments, shipping interests, commercial and civil organizations, and representatives of port-linked industries. All statements for the record, both oral and written, indorsed the proposal to further deepen Baltimore Harbor and Channels.

INVESTIGATIONS FOR THE GENERAL DESIGN MEMORANDUM

HYDROGRAPHIC SURVEYS

9. Hydrographic Conditions Surveys were conducted on all project channels between June and September 1977. In the Virginia channels, cross sections were made every 400 feet with soundings every 50 feet. In the Maryland channels, cross sections were made every 500 feet with soundings every 50 feet. The results of the surveys are shown in Appendix A.

TABLE H-1

PROSPECTIVE DEEP DRAFT COMMERCE
BALTIMORE HARBOR & CHANNELS REVIEW REPORT, 1969
(net tons)

COMMODITY	Base-year Commerce (1)	1975	2000	2025
Iron Ore				
Canada	3,447,000	4,100,000	6,400,000	9,400,000
Venezuela	3,263,000	3,800,000	6,000,000	8,900,000
Liberia	1,746,000	2,300,000	3,200,000	4,800,000
Other	2,549,000	3,400,000	4,700,000	7,000,000
Total	11,005,000	13,600,000	20,300,000	30,100,000
Residual and Fuel Oils				
U.S. Gulf	2,979,000	3,100,000	6,400,000	6,400,000
Foreign	2,549,000	4,600,000	9,600,000	9,600,000
Total	5,528,000	7,700,000	16,000,000	16,000,000
Crude and Petroleum Products				
U.S. Gulf	1,250,000 (2)	1,700,000	3,400,000	3,400,000
Foreign	877,000	1,100,000	2,200,000	2,200,000
Total	2,127,000	2,800,000	5,600,000	5,600,000
Coal				
Japan (metallurgical)	484,000	900,000	900,000	900,000
Germany (steam)	516,000	600,000	600,000	600,000
France (70% metall., 30% steam)	530,000	900,000	1,150,000	1,500,000
Other	892,000	1,260,000	1,800,000	2,700,000
Total	2,422,000	3,660,000	4,450,000	5,700,000
Chrome Ore	401,000	496,000	740,000	1,100,000
Total, all deep-draft commerce	21,483,000	28,256,000	47,090,000	58,500,000

(1) 1966 for all items except coastwise petroleum which is 1964 commerce.
(2) Excluding pipeline movement of gasoline and other clean products.

TABLE H-2

SUMMARY OF ECONOMIC JUSTIFICATION FOR
BALTIMORE HARBOR & CHANNELS REVIEW REPORT, 1969

		Depth	Annual Benefits ($1000)	Annual Costs ($1000)	Benefit-Cost Ratio	Net Benefits ($1000)
1.	Main Channel from Cape Henry to Fort McHenry and Branch Channels in Curtis Bay and Northwest Branch	43'	1,521	1,648	0.93	—
		44'	2,855	2,166	1.32	689
		45'	3,854	2,847	1.35	1,007
		46'	4,652	3,423	1.36	1,229
		47'	5,398	4,092	1.32	1,306
		48'	6,193	4,694	1.32	1,499
		49'	6,900	5,316	1.30	1,584
		50'	7,469	5,949	1.26	1,520
2.	Northwest Branch-West Channel	29'	550	23	23.9	527
		30'	853	26	32.8	827
		31'	1,149	30	38.3	1,119
		32'	1,436	33	43.5	1,403
		33'	1,708	37	46.2	1,671
		34'	1,971	43	45.8	1,928
		35'	2,197	50	43.9	2,147
		36'	2,411	59	40.9	2,352
		37'	2,545	69	36.9	2,476
		38'	2,677	80	33.5	2,597
		39'	2,761	92	30.0	2,669
		40'	2,794	104	26.9	2,690
3.	Northwest Branch-East Channel	36'	414	16	25.9	398
		37'	814	21	38.7	793
		38'	1,178	29	40.6	1,149
		39'	1,528	39	39.2	1,489
		40'	1,752	53	33.1	1,699
		41'	1,963	65	30.2	1,898
		42'	2,158	79	27.3	2,079

TABLE H-3

SUMMARY OF ECONOMIC STUDIES
BALTIMORE HARBOR & CHANNELS - SUPPLEMENTAL INFORMATION, 1974
($1,000)

	50' Inbound 5 5/8%		50' Inbound & Outbound 5 5/8%	June 1969 Review Report 4 5/8%
	One Way	Two Way		
FIRST COST				
Federal	52,376.4	52,376.4	83,775.8	96,107.2
Non-Federal	21,531.8	21,531.8	32,784.3	3,543.0
Total	73,908.2	73,908.2	116,560.1	99,650.2
ANNUAL COSTS				
Federal	3,737.0	3,737.0	6,111.2	5,766.5
Non-Federal	1,295.1	1,295.1	1,971.9	183.0
Total	5,032.1	5,032.1	8,083.1	5,949.5
ANNUAL BENEFITS	13,186.0	15,697.0	15,697.0	7,469.0
BENEFIT-COST RATIO	2.62	3.12	1.94	1.26
NET BENEFITS	8,153.9	10,664.9	7,613.9	1,519.5

SUBSURFACE EXPLORATIONS

10. Appendix B, Geophysical Foundation Exploration Report, contains information on the regional geology and the results of investigations using Standard Penetration test borings, vibracore borings and geophysical investigations. Subsurface investigations in the Maryland channels were geophysical investigations and had limited success due to the dampening effect of the moderately thick, soft organic layer (see above mentioned Appendix B). Plates B-31 and B-32 summarize the findings of the geophysical exploration, the dredging records, and the ERTS satellite flight of 1972. In the Maryland channels, drive spoon borings are shown in areas where more difficult dredging is anticipated. All borings shown in the Virginia channels were accomplished by Standard Penetration Testing Method and/or vibracoring. The "Erosion Surface" shown on profiles in the Virginia channels was identified by geophysical survey as "pre-Recent," or the top of the Miocene, and probably represents slopes developed by above sea level erosion. The "Erosion Surface" in the Maryland channels is similar; however, this surface has been defined through interpretation of drive spoon borings, since geophysical investigations had limited success in penetrating the softer surface sediments which contained organic materials and entrapped gas.

VIRGINIA CHANNELS

General

11. The only borings available, in addition to those done for the GDM for the Virginia channels, were vibracores drilled by the Virginia Institute of Marine Science (VIMS) in 1972 and the Standard Penetration Testing Method in 1978. However, there was no record showing the horizontal or vertical position of the VIMS borings. As a result, only three borings, YSL-9, YSL-3, and YSL-4 could be used. The positions shown on the drawings are only approximate. The Virginia channel results summarized below and shown on Plates B-31 and B-32 are primarily based on work done for the GDM.

12. Drill holes based on the Standard Penetration Testing Method were accomplished by using a 1-3/8 inches I.D. by 2 inches O.D. by 24 inch long split spoon. Sample spoons were advanced by a 140 pound hammer falling 30 inches. The combined blow counts of the last foot of drive Standard Penetration are shown on the drill logs, (Appendix B, pages B-11 and B-12).

Cape Henry

13. Softer, recent sediments are expected to be encountered down to 60 feet below water surface where the "erosional surface" was encountered in boring VCC-1. The geophysical profile supports this between stations 118+80 and 10+00; between 10+00; and 22+00, a deeper, older channel was identified.

York Spit Channel

14. Softer sediments have been identified to a depth of 60 feet or more below the water surface between 156+16 and 180+00. South of this reach to the lower end, or to station 850+00, the geophysical profile projects harder material. Between stations 400+00 and 675+00, this harder zone could intermittently lie above 50 feet below water surface, with

the hardest zone near station 560+00 where stiff Miocene clay is predicted. Three vibracore borings were drilled under this contract in York Spit Channel. Two vibracore borings drilled by others have also been plotted in Plate B-32 but their location is approximate.

Rappahannock Shoal Channel

15. Harder sediments can be expected between stations (-)70+00 and (-)90+00 where geophysical profiles indicate Miocene sand and silt are above -50 feet below water surface. Three vibracore borings done for the GDM and one vibracore, RSL-4, done by others are shown on the profile on Plate B-32.

MARYLAND CHANNELS

General

16. Plate B-31 data were developed from drive spoon sampling accomplished for the 1963-1965 dredging contract and 1973 exploration for the proposed Route I-95, Fort McHenry Tunnel Crossing. Plate B-31 shows those areas where dredging records and drive spoon resistance indicates more difficult dredging. The results of geophysical investigations were generally noninformative in this area due to a thin blanket of soft sediment and trapped gas in organic material at the bottom, which "absorbed" subbottom reflections.

Craighill Cutoff Angle and Cutoff Section

17. A harder zone between Craighill cutoff angle station 4+10 and cutoff section station 12+00 has been defined as Pleistocene sands and gravels in borings AA-15 through AA-23. Dredging records during 1963 indicate harder dredging between stations 2+00 and 3+00 and stations 7+50 and 8+50 in the cutoff section.

Fort McHenry Section

18. Between stations 14+500 and 16+500, harder sand and gravel were encountered above the proposed channel deepening. Stiff clay between station 22+000 and 23+000 has been recorded in the 1965 dredging records and in boring JJ-6. Boulders of sandstone, recorded in the vicinity of station 22+600 and 22+700 probably are associated with Pleistocene alluvium that was deposited during periods of lower water surface.

East Channel

19. Limited borings in the east channel will require further exploration prior to development of contract plans and specifications. Drill holes 39 and 31 suggest higher Cretaceous sand and clay and overlying Pleistocene sands and gravels from station 2+000 and upstation and probably in the Northwest Channel as well. Reports of excavation difficulties along the Fort McHenry cable crossing support the presence of boulders related to an earlier alluvium.

Curtis Bay Channel

20. Borings used to evaluate the Curtis Bay dredging suggest harder dredging between stations 9+000 and 11+000 where sand and gravel were encountered in FF-10. Harder silt and clay between stations 6+000 and 7+000 encountered in borings C-1 through C-3 should be verified by additional exploration since the penetration resistance has never been recorded.

SUMMARY AND CONCLUSIONS

Virginia Channels

21. The York Spit channel between stations 400+00 and 675+00 and particularly in the vicinity of station 560+00 appears to have several reaches of harder material above the proposed project depth and will require the minimum predredging exploration effort. Other areas of concern lie in the Rappahannock Shoal Channel between stations (-)70+00 and (-)90+00 where more compact sand and silt have been identified.

Maryland Channels

22. Stiff clay and boulders can be anticipated in the Fort McHenry section between stations 22+00 and 23+00 and upstation of station 3+00 in the East Channel. Sands and gravels between stations 14+50 and 16+50 in the McHenry Channel and 9+00 and 11+00 in Curtis Bay will also require additional preconstruction exploration.

UTILITY INVESTIGATIONS

23. The following utility and transportation crossings exist within or immediately adjacent to the limits of the proposed work and are shown on Plate A-31.

Item A. One, 48 inch cast iron water main - Lazaretto Point to Fort McHenry.

Item B. One, 48 inch cast iron water main - Fort McHenry to Fairfield.

Item C. One, 72 inch pre-stressed concrete water main; one, 24 inch wrapped steel high pressure gas main; and five, 12 inch electric conduits - installed in the same trench - Hawkins Point to Sollers Point. The gas main is located 13.5 feet northwest of the water main. Two of the 12 inch electric conduits are located 18.5 feet and 28.5 feet, respectively, northwest of the water main. The other three electric conduits are located 8.5 feet, 18.5 feet, and 28.5 feet southeast of the water main.

Item D. Twelve, 33KV submarine electric cables - Lazaretto Point to Fort McHenry. (The six southerly cables are spares.)

Item E. Two, 26KV submarine electric cables - Lazaretto Point to Fairfield.

Item F. Old Coast Guard electric cable - Hawkins Point to Fort Carroll (abandoned in 1959).

Item G. Future Fort McHenry (Interstate 95) tunnel.

Item H. Existing harbor tunnel.

Item I. Cable area - Sandy Point to Kent Island. The existence of utility lines in this area has not been established.

24. In addition to the above utilities, there are three bridges in the project area, the Francis Scott Key Bridge, the William Preston Lane Bridge, and the Chesapeake Bay Bridge Tunnel. These crossings are not affected by the 50-foot project.

CROSSING REQUIRING RELOCATION

25. Each of the existing crossings was investigated in detail to determine if a requirement existed to relocate the utility line prior to the deepening of the channel. The investigation included obtaining "As-Built" drawings, nautical charts, crossing permits, and discussions with engineering personnel of each utility line owner and the United States Coast Guard. A description of items that will require relocation and the design standards and criteria established as the basis for determining the cost for each item follows.

Item D

26. Twelve, 33KV submarine electric cables owned by the Baltimore Gas and Electric Company, from Lazaretto Point to Fort McHenry. These cables were installed about 1937 and are in a dilapidated condition. As a result, the cables cannot be spliced and reused. They will have to be replaced from the manhole on Lazaretto Point to the manhole on Fort McHenry. They were installed in a trench about 2 feet apart centerline to centerline of cable, with the top of the cables not less than 47 feet below mean low water level where they cross the channel, and therefore, will interfere with the deepening of the channel. As the top of the cables must be a minimum of 5 feet below the proposed channel overcut, the cables must be lowered a minimum of 9 feet.

27. Information obtained from a representative of the Baltimore Gas and Electric Company indicates that the six cables on the south side are spares. A viable requirement for the six spare cables no longer exists as sufficient additional facilities now exist on each shore to handle emergency situations. Therefore, only the six active cables should be considered for relocation. An analysis of the location of the existing cables and their relationship to the relocation of the 48 inch water main (Item A) indicated that the six new cables should be installed in a 14-foot wide trench whose centerline would be 60 feet south of the existing cables for the width of the new channel. Side slopes should be 3 on 1 where the trench is underwater and 2 on 1 on land.

28. The sequence of work would include:

a. Removal of the six spare cables from the manhole and to a point 20 feet on the riverside of the seawall at each end of the relocation.

b. Excavation of the trench (stockpile material in an inner harbor site).

c. Installation of six new 3/c-350 MCM - 33KV submersible aluminum cables, each approximately 2,120 feet long, utilizing a barge and divers to lay the portion under water.

d. De-energizing and disconnecting the six existing active cables at each manhole and connection of the six new cables in each manhole.

e. Backfilling the trench at each end using stockpiled material.

f. Removal of the twelve old cables for the approximate 800 feet distance required by the channel deepening. This will require approximately 8,500 cubic yards of excavation. The material will be used to backfill over the new cables up to elevation -51. The old cables will be deposited on shore for salvage.

Item E

29. Two, 26KV submarine electric cables from Lazaretto Point to Fairfield. The Baltimore Gas and Electric Company originally installed four, 26KV cables at this location. About 1955, they removed all the underwater portions of these cables and installed two new 26KV cables, which had to be spliced in several places.

30. A representative of the Baltimore Gas and Electric Company indicated that the two cables have been de-energized for several months, that they are no longer required, and that the Company is developing plans to remove them and store for use on some future project.

31. The War Department Permit for these two 26KV submarine electric cables required that the owner remove or relocate these facilities as necessary due to future operations, without expense to the United States Government.

32. In view of the stated intent of the Baltimore Gas and Electric Company to remove these cables in the near future for salvage value, no estimate of cost has been prepared for this item and none of the cost is included as part of the non-Fedeal costs.

CROSSINGS NOT REQUIRING RELOCATION

33. The following crossings have been determined to not require any relocation action.

Item A

34. One, 48-inch cast iron water main from Lazaretto Point to Fort McHenry. As part of construction of the Fort McHenry (Interstate 95) tunnel the contractor will relocate the 48-inch cast iron water main. This City of Baltimore line was constructed in 1949, using cast iron pipe strapped to pile bents where it crosses under the east channel of the Northwest Branch. Its centerline is about 50.6 feet below mean low water for the approximate 700 feet length where it crosses the channel at an angle and, therefore, will interfere with the deepening of the channel. The pipe will need to be lowered a minimum of 5.5 feet as 3 feet of cover will be required over the pipe.

Item B

35. One, 48 inch cast iron water main from Fort McHenry to Fairfield. As it is not planned to deepen the Ferry Bar Channel, this City of Baltimore water line will not have to be relocated. A portion of the line just south of Fort McHenry will require relocation as part of the Fort McHenry Tunnel (Interstate 95) project.

Item C

36. One City of Baltimore 72 inch water main; one Baltimore Gas and Electric Company 24 inch gas main; and five Baltimore Gas and Electric Company 12 inch conduits from Hawkins Point to Sollers Point. The top of all pipes where they cross the main channel are about 70 feet below mean low water.

Item F

37. Old Coast Guard electric cable from Hawkins Point to Fort Carroll. This cable served a navigation light on Fort Carroll. It was de-energized and abandoned in place by the Coast Guard in 1959. Its exact location and depth is not known. At the time of construction, the dredging contractor will be required to precisely locate the cable.

Item G

38. Approximate location of the future Fort McHenry Tunnel. Information furnished by the City of Baltimore Interstate Highway Division indicated that design began during the summer of 1978, construction has begun and the project will be completed in 1985. The top of the tunnel will be about 60 feet below mean low water at the channel crossings. Representatives of the City and the Baltimore Gas and Electric Company have indicated a desire to relocate their utilities alongside this tunnel.

Item H

39. While this item does not require relocation as a part of the channel deepening, it represents an area that should be "off-limits" to dredge when lowering "spuds" for anchoring or similar operations as such action could result in serious damage.

Item I

40. Cable area from Sandy Point to Kent Island. This cable area is shown on Nautical Charts 12273, 12278, and 12282. This area is outside the limits of channel excavation and is shown for information only.

BAY MODEL TESTS

41. The Plan of Study (POS) for this General Design Memorandum, May 1977, identified three separate tests to be performed on the Chesapeake Bay Hydraulic Model in regard to the Baltimore Harbor and Channels AE&D Study. These tests included a hydrodynamic test to predict current velocity and salinity changes in the estuary as a result of constructing the authorized 50-foot channel; a shoaling test to predict maintenance requirements with a 50-foot channel; and a fate of dredged materials test to determine the probable movement and deposition patterns of channel dredged material deposited in open waters of the estuary.

42. Subsequent to the POS, as existing baseline information was evaluated (e.g., historic maintenance records, history of disposal operations) and working experience was accumulated with the model during the verification process, it became apparent that the shoaling and fate of dredged materials tests would not develop more reliable or useful predictions than the traditionally employed method of projecting past experiences of operating and maintaining the channel works due to insufficient prototype (existing) data.

43. An evaluation of the channel shoaling history revealed that:

a. Historically, 65 to 75 percent of project maintenance dredging has occurred in the Brewerton and Craighill angles of the Maryland channel sections.

b. There has been no perceptible increase in shoaling rates as authorized channel depths have increased.

c. It is very difficult to determine patterns of shoaling and scouring from existing data.

d. Both prototype and hydraulic model data indicate that nearly all sediment movement is caused by ship energy.

44. The adjustment of an estuarine hydraulic model so that it accurately reproduces shoaling patterns is a time consuming and expensive process. Because ship energy appears to be the prime cause of sediment movement, preparations for this study would include the installation of "ship simulators" in the Chesapeake Bay Model. It is estimated that the shoaling verification and study for this portion of the Baltimore Harbor project would take as long as one year to complete at a cost of nearly $1 million.

45. As a result, the shoaling and fate of dredged material tests were eliminated. Hydrodynamic test to predict current velocity and salinity changes was conducted from 29 July 1978 through 29 October 1978 using a drought year (water year 1965 hydrograph) and an average inflow year hydrograph. Results of these tests may be found in Section K.

ECONOMIC STUDIES

46. Economic investigations for this GDM were directed toward affirming the findings of the Project Document studies. Costs and benefits were calculated for deepening to the authorized depths of 50 feet in the main channels and the Curtis Bay channel, 49 feet in the Northwest Branch-East Channel, and 40 feet in the Northwest Branch-West Channel. Studies and projections were made for those commodities currently moving in deep-draft vessels. In addition to those commodities evaluated for the Project Document (iron ore, petroleum, coal, chrome ore, sugar, and general cargo), manganese ore and grains were considered as potentially susceptible to advantages of deep-draft shipping. New future fleet size distributions were prepared for each commodity and trade area, over both existing and improved channel depths. Based on the latest available vessel hourly operating costs and other transportation costs gathered from port interests, total round trip costs and unit shipping costs were calculated for each trade country by vessel size and channel depth. Average annual transportation savings were then calculated considering the future fleet and commerce projections over the 50 year project life. Details of these investigations are presented in Section P, "Benefits." The cost estimates are presented in Section O.

PUBLIC INVOLVEMENT

47. Public involvement to date has consisted of: coordination with port related interests concerning commerce projections, interagency coordination necessary to reaffirm the feasibility of the authorized plan, formation of a Technical Advisory Group, and local/regional coordination for obtaining local assurances. The post authorization study has been fully coordinated with concerned Federal, State, and local agencies and interests in conjunction with the public meeting held on 24 June 1981.

48. Meetings were held with the port related interests in order to solicit their opinions and perceptions of future commerce projections and to reaffirm their need for a 50-foot channel. State and local interests (Maryland Port Administration and Greater Baltimore Committee) and port users (Bethlehem Steel Corporation, Exxon Company, AMSTAR, Baltimore and Ohio Railroad Company, Amerada-Hess Corporation, Canton Railroad Company, Indiana Grain Cooperative, CSY Finance, Inc., and John S. Connor, Inc.), participated in this endeavor.

49. Coordination and meetings for the purpose of reaffirming the authorized plan have taken place with various Federal, State, and local agencies. The United States Coast Guard and Association of Maryland Pilots provided comments and information regarding the one-way channel concept discussed in the Project Document, authorized channel widths, and required keel clearances. A detailed discussion of these issues is contained in Section I, "Plan Formulation". In order to adequately address the environmental considerations of the authorized plans, a technical advisory group was formed with the following agencies participating: Environmental Protection Agency, Fish and Wildlife Service, National Marine Fisheries Service, Maryland Department of Natural Resources, Virginia Institute of Marine Science, Virginia Soil and Water Conservation Commission, Maryland Port Administration, and Norfolk District, Corps of Engineers. The advisory group's objectives and accomplishments are discussed in Section J, "Public Views and Responses".

50. Local/regional coodination was established with the Maryland Port Administration, State of Maryland, and Commonwealth of Virginia, regarding local cooperation for the project. Meetings have been held with the above interests, both individually and jointly, to discuss the project and outline the required local assurances.

51. Following coordination of the draft GDM and draft EIS, a public meeting was held on 24 June 1981. After the public meeting, the data presented at the meeting and the comments received in response to the draft report was reviewed and fully considered. There will not be any additional public meetings after the Division Engineer's notice is issued. The only remaining involvement will be execution of the Section 221 agreement with the State of Maryland. Planned coordination and dissemination of information from the environmental monitoring program will take place.

ENVIRONMENTAL

52. The report to the Chief of Engineers and the Board of Engineers for Rivers and Harbors, contained within House Document No. 94-181, recommended that "project-related studies should be undertaken. . . and should be continued during the construction period to guide dredging and disposal operations and to observe their effects upon Chesapeake Bay." Environmental investigations were conducted during the Advanced

Engineering and Design study phase. These investigations included bulk chemical analysis, elutriate tests, and sediment analysis designed to locate any potential contaminants. Results indicate that material within Baltimore's inner harbor is polluted, however, it diminishes in level of contamination as the harbor mouth is approached. Material from the Virginia channels has been found to contain low levels of all parameters tested. In addition, studies concerning the fate of dredged material after placement in the Bay were investigated and are further detailed in Section K.

53. Also, a monitoring plan to observe the effects the dredging and placement of dredged material is being developed for preconstruction, during construction and post construction activities. This plan is being developed and coordinated through the Technical Advisory Group. The current estimate included in the project cost for monitoring is $3.5 million.

SECTION I

PLAN FORMULATION

GENERAL

1. As mentioned previously in Section G, "Alternatives," and consistent with the Plan of Study, May 1977, this report is an affirmation study conducted to determine if the authorized plan of improvement remains justified. Therefore, plan formulation has been primarily directed to affirming the economic justification and safety considerations of the authorized project depths, widths, and alignments and to the evaluation of the environmental impacts of the authorized plan. Additional plan formulation work has been performed to respond to comments from the Office of Management and Budget on the feasibility of a one-way channel.

CHANNEL DEPTH

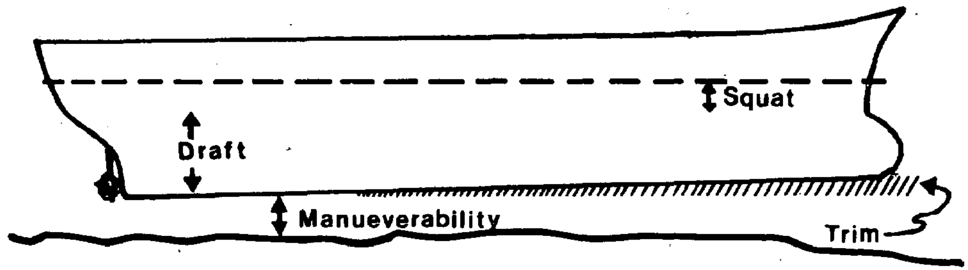
2. Affirming the continued economic justification of the authorized project dimensions, including channel depth, required updating of the commodity projections and fleet size distribution presented in the Project Document in order to compute the current transportation savings on which the benefits of project implementation are based. The results of these investigations are found in Section P. Table L-5 compares the projected benefits with the projected costs for project implementation, found in Section O. This comparison affirms the continued economic justification of the authorized plan of improvement.

3. Additionally, a reevaluation of the operational safety considerations of the authorized project dimensions was performed to include the results of the current fleet size distribution projections. The following discussion regarding the safety aspects of channel depth concludes that the authorized depth is the best depth from a safety standpoint.

4. When considering channel depth, it is important to remember that the design depth and available draft are not equivalent. This results from safety considerations which require sufficient water depth under the keel of a vessel to insure safe and efficient operation. A discussion of the factors to be considered when determining required keel clearance is included in the Project Document and, since no changes have occurred in that analysis, that discussion is not repeated herein. The following figure graphically summarizes the keel clearances considered necessary for deep draft vessels using the major channels of the port of Baltimore.

FIGURE I-1

FACTORS AFFECTING CHANNEL DEPTHS



Navigation Factor	Allowable Depth in Feet
Squat	2 feet
Trim	1 foot
Maneuverability	2 feet
TOTAL	5 feet

This depth under the keel will be used for the channels at Baltimore.

5. As presented late in Section P, "Benefits," the world dry bulk and tanker fleets have increased in overall tonnage and average vessel size over the past two decades. However, the dry bulk and tanker fleets calling on the port of Baltimore are constrained by factors such as volume of trade, cargo handling and storage facilities, and channel depth. Accordingly, the growth of the vessel size of the dry bulk and tanker fleets calling on Baltimore has not been as dramatic as that experienced by the world fleet.

6. Since economic incentives of private industry are profit oriented, the safety considerations of a 5-foot keel clearance are often overlooked in order to accommodate deeper draft vessels. Over the past decade, there has been a significant increase in the number of vessels transiting the Baltimore channels with drafts in excess of 37 feet. The draft of 37 feet is derived by subtracting 5 feet from the existing project depth of 42 feet. For dry bulk vessels, the number of trips exceeding 37 feet has increased from 122 in 1967 to 236 in 1974 then declining slightly to 187 in 1976. For the tanker fleet calling on the port, the number of vessel trips exceeding 37 feet has increased from 7 in 1967 to 91 in 1976.

7. It is impossible to estimate the damage which would occur should a heavily laden vessel run aground and spill its cargo. Vessel damage figures could be approximated, but the dollar value of long-term damage to the environment, especially the fisheries industry, could not be anticipated. For this reason, figures such as presented in the preceding paragraph showing close to 300 vessel trips per year exceeding the recommended 5-foot keel clearance is an alarming fact. This condition will continue in the future should the 50-foot project not be constructed. Once the 50-foot project was built, the number of vessels exceeding the 5-foot keel clearance (i.e., draft of 45 feet) would decrease drastically. It is apparent that channel depths less than presently authorized should not be considered further.

8. In the Project Document, determination of channel widths was based on the results of investigations made during the study of the proposed sea level Panama Canal. The factors considered in the Project Document analysis included whether a passing situation could occur, vessel controllability, vessel speed relative to channel bottom, current velocities and direction, and depth of water under the keel of the vessel, whether the channel occupies the entire waterway and the characteristics of the channel banks. Figure I-2 illustrates how the authorized channel widths were determined.

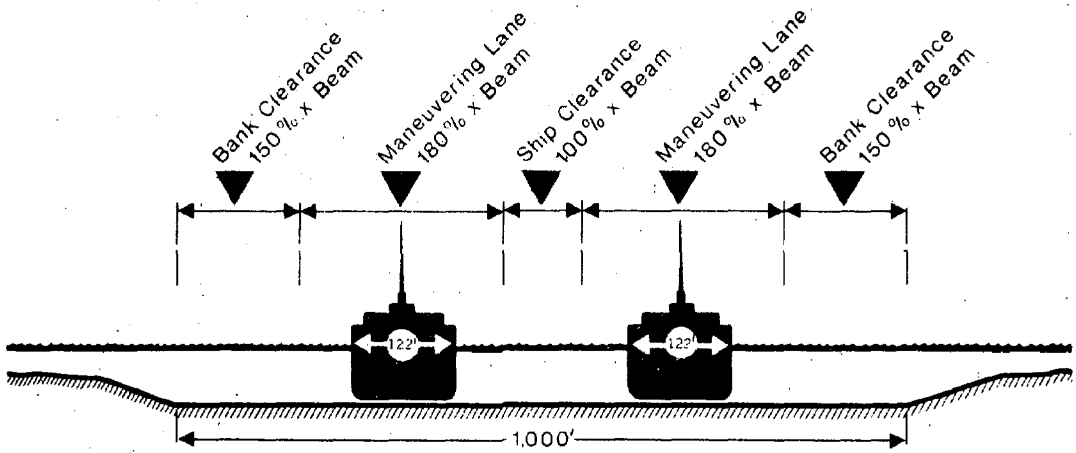
9. In recent years, additional research has been conducted on handling problems of very large ships and required widths of shipping channels. These studies include theoretical analysis, model testing, and in many instances, the experience of pilots. Of the various publications available, the paper entitled, "Handling Problems of Very Large Ships in Approach Channels and Maneuvering Areas," by C. J. Kray was used as the primary source of information. The discussion of layout and width of approach channels in the referenced paper lists the same factors to be considered in channel design as those previously mentioned from the Project Document analysis. However, in this discussion, channels are divided into two types. Open channels are defined as natural or dredged access channels constituting the deepest portion of a bay, river, strait, or maneuvering area, whereas restricted channels are those excavated access channels or canals, restricted inland sea extensions, canals between islands, or between mainland and islands.

10. On the basis of tests conducted at David Taylor Model Basin, United States Navy, various relationships were derived for estimating channel width in open and restricted channels. Table I-2 presents the design criteria developed for two-way channels.

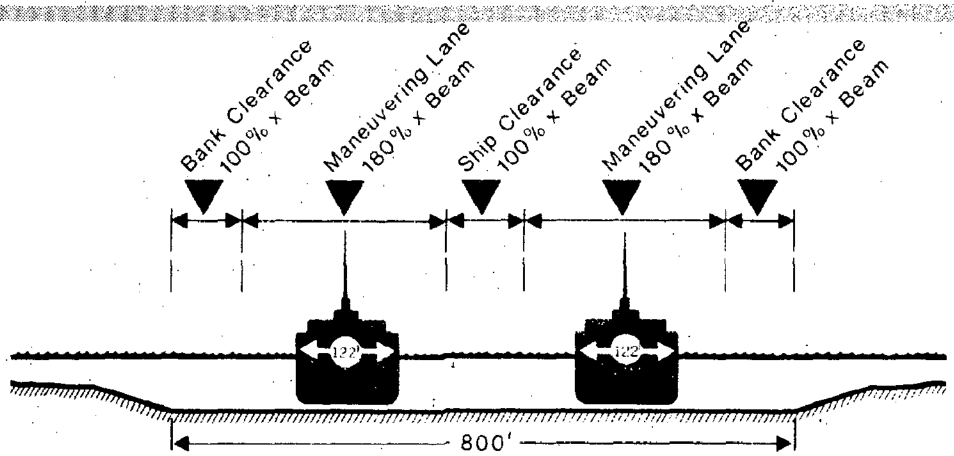
11. Design of open channels should use derivative values on the lower side of the range and conversely for restricted channels. As mentioned earlier, the values used in the Project Document were based on results of investigations made during the study of the Panama Canal, a restricted channel. The Baltimore Harbor and approach channels are open channels and accordingly, the derivative values used in the Project Document are considered high. The channel widths have been recomputed in Table I-3 utilizing open channel derivatives, updated design ships, and other criteria previously mentioned.

12. The recomputed channel widths for the Virginia channels, Main Ship Channels into Baltimore, and Northwest Branch-West Channel, indicate that the authorized channel widths of 1,000, 800, and 600 feet, respectively, are still adequate. The calculations according to the formula indicate that channel widths for Curtis Bay Channel and Northwest Branch-East Channel, shown in the Project Document, appear low. However, upon closer examination of the actual circumstances, it is seen that in computing channel widths, the "design vessel" many times represents only 5 to 10 percent of the total future fleet expected to call on the Port of Baltimore. When determining channel widths for branch channels measuring 1 to 2 miles in length, the need to design for optimal conditions in accommodating the largest vessel is questionable. The lower DWT ranges constitute a considerably higher percentage of the future fleet. If vessel dimensions for the lower DWT ranges are utilized in the channel design, the computed channel widths for both the Curtis Bay Branch Channel and Northwest Branch-East Channel reduce to

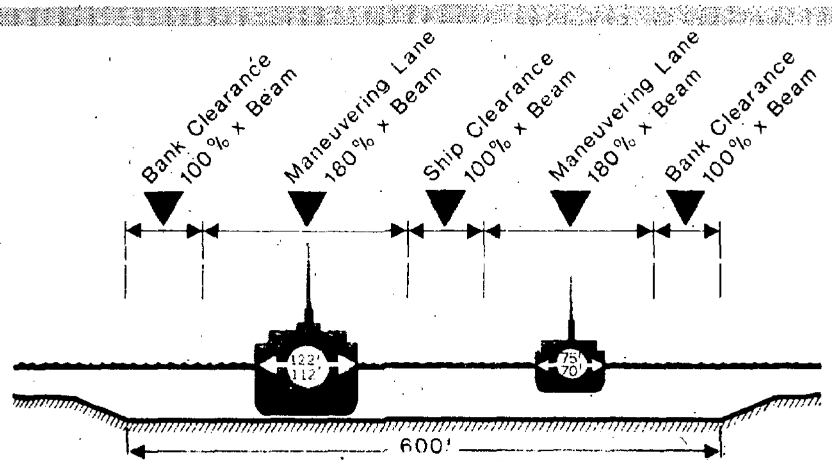
DETERMINATION OF AUTHORIZED CHANNEL WIDTHS
(Taken from the Project Document)



VIRGINIA CHANNELS - 90,000 DWT CARRIERS PASSING



MAIN SHIP CHANNELS - 90,000 DWT CARRIERS PASSING



BRANCH CHANNELS - CURTIS BAY - 90,000 DWT COLLIER AND 75000 DWT TANKER
N.W. BRANCH - 70,000 DWT TANKER AND C-3 CARGO VESSEL

FIGURE I-2

TABLE I-2

CRITERIA FOR DETERMINING CHANNEL WIDTHS
FOR TWO-WAY DEEPWATER CHANNELS

Channel Element	Derivative Range in % of Beam Width of Vessel
Bank Clearance	60 to 200
Maneuvering Lane	170 to 180
Ship Clearance	100
Maneuvering Lane	170 to 180
Bank Clearance	60 to 200

600 feet. Although the channel width computed in Table I-3 for the Curtis Bay Channel and Northwest Branch-East Channel indicate a required width of 710 feet and 690 feet, respectively, it is not deemed necesary to provide a channel wider than 600 feet because of the short channel lengths and relative low number of passing situations expected to occur between the larger DWT vessels. In addition, vessels within these branch channels are constantly under the escort of tugs. The Maryland Pilots in their letter of 28 April 1978 indicated that the authorized channel widths appear adequate and should provide acceptable maneuvering conditions.

FEASIBILITY OF ONE WAY CHANNEL

13. The 28 March 1975 comments of the Office of Management and Budget, printed on page vii of the Project Document, stated:

> "We noted that the Coast Guard has raised a question of safety with regard to the one-way channel. Therefore, we suggest that a joint Corps/Coast Guard study of the safety aspects of operations be undertaken, including cost considerations, prior to the initiation of project construction."

14. The reporting officers had recommended that the inbound channels be deepened first, followed by deepening of the outbound channels, in order to more quickly realize project benefits. This recommendation would create, in effect, a temporary one-way channel. In order to adequately address OMB's comments, meetings were initiated with the 5th District, United States Coast Guard (hereinafter referred to as the Coast Guard), and the Association of Maryland Pilots (hereinafter referred to as the Maryland Pilots). The following paragraphs present a reanalysis of the proposed one-way channel. Copies of all correspondence with the Coast Guard and the Maryland Pilots is presented in Appendix E, Pertinent Correspondence.

15. As part of the Project Document, the 19 July 1974 Supplemental Information report addressed the possibility of narrower channels from two aspects; a single inbound lane channel for inbound deep draft traffic only, or a single inbound lane for two-way traffic. Because of inherent safety deficiencies, the Coast Guard did not endorse the

deepening of only half of the channel and the single lane channel concept was dropped from further consideration as a long-term solution. However, the 1974 Supplemental Information report did recommend dredging the inbound portions of the channels first so that most of the project benefits could be realized as soon as possible. Utilizing an 8 year construction schedule which was considered in 1974, based on this concept, the inbound channel would be completed in 5 years and the entire project completed 3 years later.

16. In reanalyzing the feasibility of one-way channel construction, the Coast Guard clearly opposed this method of construction since operation of a one-way channel for any period of time is unsafe. Other items inherent in the operation of a one-way channel were discussed with the Coast Guard and Maryland Pilots. The items discussed are as follows and the conclusions from these discussions are presented in the subsequent paragraphs.

a. Need for and cost of additional navigation aids.

b. Inherent problems of navigating the channels after the centerline or edge of the deeper inbound channel has been marked with buoys.

c. Problems associated with operating 60,000 to 150,000 DWT vessels in a narrower inbound channel.

d. Economic incentives of using a deep draft inbound channel for outbound traffic and safety problems with such unorthodox usage.

e. Economics involved in dredging a one-way channel.

17. During the meeting with the Coast Guard on 16 February 1978, the need for additional navigation aids to mark a deeper single lane channel (DSLC) was discussed. At present, the channel sides are marked randomly and ranges have been established to mark the centerline of each channel. During most of the passage through the channels, the vessels align with these ranges. Only during passing situations do they move to the outside of the channel. If a DSLC were constructed, it would become necessary to mark the inside edge of the DSLC possibly every mile, and establish new ranges for both the inbound and outbound channels. The first cost for additional buoys and ranges is estimated at $1 to $2 million with annual maintenance costs equaling 10 percent of the first cost.

18. The addition of buoys within the existing channel boundaries for the purpose of marking the edge of a DSLC will present navigation difficulties. The DSLC proposal in the Project Document specified channel widths of 1,000 feet for the Cape Henry Channel (full width), 600 feet for the York Spit and Rappahannock Channel, 500 feet for the Main Ship Channels, and 300 feet for the Curtis Bay Channel and Northwest Branch-East Channel. Figure I-3 shows the location of the DSLC with respect to the existing channel configuration. Although these DSLC widths would provide reasonable room for safe transit and maneuvering of 140,000 DWT vessels, the opposing lane would be reduced to 400 feet in the York Spit Channel and 300 feet in the Rappahannock Shoal Channel, Main Ship Channels, and Branch Channels. Ships customarily steer along the centerline of the channel, moving to the channel side to permit meeting and overtaking other vessels in the waterway, then returning to the centerline position. Under the buoyed channel

TABLE I-3

RECOMPUTED CHANNEL WIDTHS FOR THE BALTIMORE HARBOR AND APPROACH CHANNELS

VIRGINIA CHANNELS 1/

Channel Element	Derivation	Element Widths
BC	120% x beam of bulk carrier	167 feet
ML	180% x " " " "	261 feet
SC	100% x " " " "	145 feet
ML	180% x " " " "	261 feet
BC	120% x " " " "	167 feet
Total Width Of Channel		1001 feet

MAIN SHIP CHANNEL INTO BALTIMORE 1/

Channel Element	Derivation	Element Widths
BC	60% x beam of bulk carrier	87 feet
ML	170% x beam of bulk carrier	247 feet
SC	100% x beam of bulk carrier	145 feet
ML	170% x beam of bulk carrier	247 feet
BC	60% x beam of bulk carrier	87 feet
Total Width Of Channel		813 feet

CURTIS BAY BRANCH CHANNEL 2/

Channel Element	Derivation	Element Widths
BC	60% x beam of bulk carrier	85 feet
ML	170% x beam of bulk carrier	240 feet
SC	100% x beam of bulk carrier	141 feet
ML	170% x beam of tanker	180 feet
BC	60% x beam of tanker	64 feet
Total Width Of Channel		710 feet

TABLE I-3 (cont'd)

NORTHWEST BRANCH - EAST CHANNEL 3/

Channel Element	Derivation	Element Widths
BC	60% x beam of bulk carrier	74 feet
ML	170% x beam of bulk carrier	211 feet
SC	100% x beam of bulk carrier	124 feet
ML	170% x beam of tanker	207 feet
BC	60% x beam of tanker	73 feet
Total Width Of Channel		689 feet

NORTHWEST BRANCH - WEST CHANNEL 4/

Channel Element	Derivation	Element Widths
BC	60% x beam of bulk carrier (grain)	74 feet
ML	170% x beam of bulk carrier (grain)	211 feet
SC	100% x beam of bulk carrier (grain)	124 feet
ML	170% x beam of bulk carrier (sugar)	155 feet
BC	60% x beam of bulk carrier (sugar)	55 feet
Total Width Of Channel		619 feet

1/ Based on 140,000 DWT bulk carrier with 141 foot beam.

2/ Based on 140,000 DWT bulk carrier with 141 foot beam and 60,000 DWT tanker with 106 foot beam.

3/ Based on 100,000 DWT bulk carrier with 124 foot beam and 90,000 DWT tanker with 122 foot beam.

4/ Based on 100,000 DWT bulk carrier for grain with a 124 foot beam and 40,000 DWT bulk carrier for sugar with a beam of 91 feet.

proposal, all vessels using the channel, both inbound and outbound, will be compelled to transit in the off-centerline position. It would be impossible to operate the 100,000 to 140,000 DWT vessels calling on the port in these extremely narrow zones. The Maryland Pilots indicated that navigation bridge levels and deck cargo configurations on many vessels limit visibility in the area forward of the vessel so that buoys may be lost from sight within one-half mile of the ship. When wind, current, bank effects, and steering angles are taken into account, it is obvious that collision with buoys will be inevitable.

19. Because of the Coast Guard's requirement that both sides of the DSLC be marked with buoys, vessels will be required to sail off the centerline of a narrow channel. This type of operation generates an asymmetrical flow condition around the body of the ship causing a side-force toward the near bank and a turning movement away from the near bank. These forces tend to draw a vessel toward the bank while turning the bow toward the middle of the channel. This deterioration of directional stability will require constant rudder angle (course compensation) toward the near bank during the entire passage (50 miles), instead of during limited passing or overtaking situations. This effect will increase the effective width of a vessel and further decrease passing distances and bank clearance.

20. The unit savings in shipping costs derived from using larger vessels is presented in Section P, "Benefits." These figures represent an estimated annual savings of $20,618,000 for imports and $135,838,000 for exports, which would provide economic incentives for using a deeper inbound channel for outbound traffic or a deeper outbound channel for inbound traffic. Regulations forbidding such usage could be implemented, but enforcement of such regulations would be difficult if not impossible. The possibility of such unorthodox usage of the channels will always exist if a DSLC is constructed first. Safe operation of vessels under such unorthodox procedures would require highly reliable communication systems among piloted vessels, tugs and barge traffic, local commercial freighters, coastwise traffic operating with independent pilots, and other small craft. Any breakdown in communication could result in a serious mishap. Delays in inbound vessels of up to 2 hours could be expected which would increase shipping cost per ton. The extension of transit time to 14 or 15 hours under the supervision of one pilot is unreasonable and unsafe.

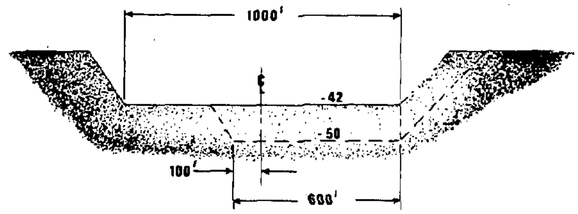
21. Additionally, the import/export makeup of the port has changed in recent years to a point where neither dominates. In the early 1970's, the major portion of the deep draft traffic passing through the port was imports. This domination by the import traffic was the basis for the single inbound lane construction concept. Because the recommended dredging schedule is much shorter than in the Review Report (4 years versus 8 years), less benefits would be derived by dredging a single lane (inbound or outbound) channel first; and the costs involved with additional aids to navigation, vessel traffic control systems, regulation and policing which would be required by this concept offset any benefits to be derived.

DISPOSAL AREAS

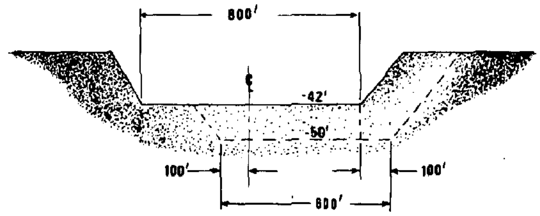
22. In discharging the Federal responsibility to assess the suitability of the disposal areas provided for the Baltimore Harbor Channels deepening, technical investigations were performed at identified sites as well as at several additional locations. In all, 10 sites were examined. Evaluation of study data and site availability through local sponsor identification resulted in numerous site rejections or standby status. Designated project disposal areas are fully discussed in Sections K and L. Table I-4 summarizes the evaluation process. For an overview of dredged material management in the Chesapeake Bay, refer to the Addendum.

LOCATIONS OF SINGLE LANE CHANNELS

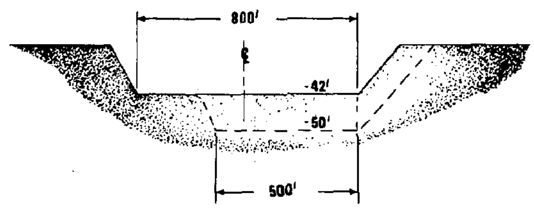
YORK SPIT CHANNEL



RAPPAHANNOCK SHOAL CHANNEL



MAIN SHIP CHANNEL



CURTIS BAY (-50) CHANNEL AND NORTHWEST BRANCH, EAST CHANNEL (-49)

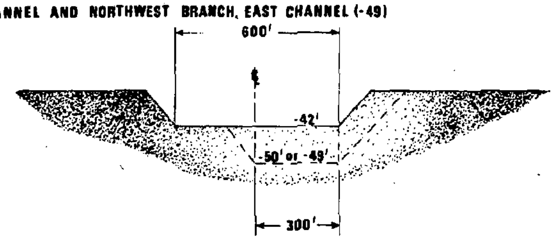


FIGURE I- 3

TABLE I-4

DISPOSAL AREAS EVALUATION SUMMARY

SITE	LOCATION	FIGURE NUMBER	TYPE 1/	GDM INVESTIGATIONS 2/	STATUS	REMARKS
Hart & Miller Islands	Upper Chesapeake Bay (UCB)	L-4	Contained	None	Selected	Subject of EIS prepared for regulatory permit and identified by non-Federal sponsor.
Kent Island	UCB	None	Open water	1. Bulk chemical 2. Elutriate 3. Sediment type	Not offered by non-Fed. sponsor.	Historically utilized disposal area.
Patapsco River Neck	UCB	None	Open water	1. Bulk chemical 2. Elutriate 3. Sediment type	Not offered by non-Fed. sponsor.	Historically and currently utilized disposal area.
Smith Island	UCB	None	Wetland creation	1. Cultural recon 2. Feasibility analysis	Rejected	Rejected on basis of excessive transportation costs.
Tangier Island	Lower Chesapeake Bay (LCB)	L-2&3	Wetland creation	1. Cultural recon 2. Cultural survey 3. Feasiblity analysis	Not identified by non-Fed sponsor	Subject to Commonwealth of Virginia interest (refer to Section L). Excessive construction costs.
Rappahannock Shoal Deep	LCB	L-2	Open water	1. Bulk chemical 2. Elutriate 3. Sediment type 4. Cultural recon	Selected	Historically utilized disposal area.
Wolf Trap	LCB	L-1	Open water	1. Bulk chemical 2. Elutriate 3. Sediment type 4. Cultural recon 5. Cultural survey	Selected	Historically utilized disposal area.

PUBLIC VIEWS AND RESPONSES

1. The public involvement program for the combined Phase I-II GDM, as specified in the report entitled "Baltimore Harbor and Channels, Maryland and Virginia, Advanced Engineering and Design, Plan of Study," consists of public participation and agency coordination. To insure that the views of public officials, interested citizens, and special interest groups are considered, and that they are kept aware of the study progress, the public participation consists of a public meeting. Regarding agency coordination, the effort has been directed in two areas. The first was to pursue the interagency and local coordination necessary to carry out a planning process and reaffirm the feasibility of the modification. This coordination has investigated and elaborated upon issues raised during earlier coordination of the project documents and any new issues. The second area concerned the development of agreements for local cooperation. The need to develop satisfactory institutional arrangements required both local and regional coordination and agreement. The coordination for obtaining local assurances has primarily involved the State of Maryland.

PUBLIC PARTICIPATION

2. A public hearing was held on 24 June 1981 at the Hilton Hotel in Baltimore, Maryland. The hearing was conducted by Colonel James W. Peck, District Engineer, U. S. Army Engineer District, Baltimore and was attended by approximately 175 persons including: representatives of Federal, State, and local governments; officials of commercial, civic, and environmental organizations; representatives of business interests; and interested individuals. The purpose of this meeting was to inform interested parties of the findings and recommendations of the Corps' study. The recommended plan was presented to the public in some detail. Both concurrence with and opposition to the Corps' recommended plan was voiced by the speakers at the meeting. Major concerns raised at the meeting were, the use of Hart-Miller Islands as a disposal site, the effects of salinity changes in the bay and the movement of contaminated sediments out to the bay.

AGENCY COORDINATION

INTERAGENCY AND LOCAL COORDINATION

ADVISORY COMMITTEE

3. On 3 December 1976, letters of invitation to participate in an ad-hoc technical advisory group (TAG) regarding environmental considerations of the authorized modification were sent to the following individuals:

- Regional Director, Environmental Protection Agency, Region III
- Regional Director, Fish and Wildlife Service
- Regional Director, National Marine Fisheries Service
- Director, Water Resources Administration, Department of Natural Resources, State of Maryland

Director, Virginia Institute of Marine Science
Executive Secretary, State Water Control Board, Commonwealth of Virginia
Deputy Director, Virginia Soil and Water Conservation Commission
Administrator, Maryland Port Administration
Chief, Water Resources Planning Branch, Engineering Division, Norfolk District, Corps of Engineers
Administrator, Virginia Council on the Environment
Executive Director, Virginia Port Authority

4. All those contacted named representatives and participated in a meeting on 17 December 1976 with the Corps of Engineers in Baltimore. During this meeting, project background information and the general scope of work required for a Phase I and II GDM was presented to the group, as well as contemplated study schedules. Information regarding existing data and specific environmental concerns were elicited from those present. This group met periodically for the duration of the study to assist in the identification of existing information sources, remaining information needs, means of data collection, specific concerns, and to provide timely contributions to and review of the study documents.

5. Subsequent to the 17 December 1976 meeting, the TAG convened 7 April 1977, 11 May 1977, 30 May 1977, 24 October 1978, 16 March 1981, and 25 March 1981. Between meetings, information and concerns were communicated by letter or through telephone conversation.

AGENCY REVIEW

6. The appropriate Federal and State agencies having an interest in the study area and the authorized improvements were advised of study initiation and availability of the Plan of Study in July 1977. The Plan of Study was provided to the agencies for information. The appropriate Federal and State agencies were provided draft copies of the GDM and accompanying draft Environmental Impact Statement for their review and comment. Pertinent comments received are incorporated and copies of the correspondence included in Addendum II, Public Views and Comments and the Final Environmental Statement. The Federal and State interests with which the District has coordinated are listed in the following paragraphs.

Federal Agencies

7. Federal interests with which the District has coordinated the draft and will coordinate the final are:

Department of Agriculture
  Economic Research Service
  Soil Conservation Service
Department of Commerce
  Bureau of Domestic Commerce
  Bureau of Economic Analysis
  Economic Development Administration
  Maritime Administration
  National Oceanic and Atmospheric Administration

National Marine Fisheries Service
National Ocean Survey
Office of Coastal Zone Management

Department of Health and Human Services
Department of Housing and Urban Development
Department of Interior
- Heritage Conservation and Recreation Service (now incorporated with the Park Service)
- Office of Water Research and Technology
- U.S. Fish and Wildlife Service
- U.S. Geological Survey

Environmental Protection Agency
U.S. Coast Guard

State Agencies

8. State interests with which the District has coordinated are listed below. Coordination with the state interests has been handled through the Maryland and Virginia State Clearinghouses.

Maryland

Department of Agriculture
Department of Economic and Community Development
Department of Health and Mental Hygiene
Department of Natural Resources
Department of State Planning
Department of Transportation
Maryland Port Administration
Highway Administration
Soil Conservation Service
State Extension Service
State Historic Preservation Office

Virginia

Department of Commerce and Resources
Department of Agriculture and Commerce
Department of Conservation and Economic Development
Department of Health
Historic Landmarks Commission
Transportation and Public Safety
Virginia Port Authority
State Water Control Board Council for the Environment

Local Input and Review

9. On 21 June 1977, the Maryland Port Administration sponsored a meeting among the port users and the Baltimore District in order to provide an update of the study progress and initiate contact with the port users. Numerous meetings were held between the District and port users on a one-to-one basis in order to obtain information relative to the economics of the project. Other local entities, such as the Greater Baltimore Committee, also provided information relative to the economics of the project. During the review period, for the draft report local interests were requested to review the report. Such entities included, but not limited to, the following:

Regional Planning Commission
Greater Baltimore Committee
Chamber of Commerce
City of Baltimore
Anne Arundel County
Baltimore County
Calvert County
Cecil County
Dorchester County
Harford County
Kent County
Queen Annes County
St. Mary's County
Somerset County
Talbot County

Virginia

City of Norfolk
City of Portsmouth
City of Newport News
Accomack County
Glouchester County
Lancaster County
Mathews County
Middlesex County
Northampton County
Northumberland County
Princess Anne County
York County

LOCAL COOPERATION

10. Local and regional coordination was initiated in an effort to develop and secure agreements for local cooperation. Numerous meetings, letters, and conversations have transpired concerning local cooperation and in an effort of brevity, only the major happenings are discussed further in the following paragraphs.

11. By letter of 26 August 1977, the State of Maryland was provided a copy of the authorized improvements and required items of local cooperation published in the project document. The State was requested to identify disposal areas for the Maryland and Virginia work, provide the required letter of intent, and identify a point of contact within the State. In a letter dated 29 September 1977, the Maryland Department of Transportation was identified as having the primary responsibility for promoting and implementing waterway projects and the Department of Natural Resources would continue its role in evaluating dredged material disposal sites and monitoring of actual field operations. Additionally, the State indicated that they could not be responsible for identifying dredged material disposal sites in Virginia, nor should they be obligated to provide capacity in Maryland containment sites for material dredged from the Virginia channel.

12. A meeting was held between the Baltimore District and State of Maryland on 5 December 1977 to discuss required local cooperation for the project. As a result of this meeting, the State of Maryland initiated formal coordination with the Commonwealth of Virginia.

13. By letter dated 27 December 1977, the Commonwealth of Virginia was provided a copy of the required items of local cooperation. The Commonwealth was requested to identify disposal areas and provide the required letter of intent for the Virginia portion of the project.

14. Informal meetings were held between the Baltimore District and Maryland Port Administration in early 1978 to further discuss the required local cooperation. During these meetings, copies of a draft letter of intent and 221 Agreement were made available.

15. On 7 April 1978, a meeting was held among the Baltimore District, State of Maryland, and Commonwealth of Virginia. The purpose of this meeting was to discuss identification of disposal areas in Virginia and possible arrangements between the State and Commonwealth regarding the required local cooperation.

16. At the request of the Maryland Port Administration (MPA), another meeting was held between the Baltimore District and the MPA to discuss the details of the required letter of intent. As a result of this meeting, the Maryland Department of Transportation submitted a letter of intent for the Maryland portion of the project to the Baltimore District on 12 June 1978. The letter indicated that "it is the intent of the State of Maryland that, if construction of the Baltimore Harbor and Channels (50') Project is commenced, the State shall. . ." provide the necessary items of local cooperation.

17. Due to litigation arising out of the State of Maryland's designation of Hart-Miller Islands as a dredged material placement site, the State was unable to finalize the items of local cooperation. This litigation was resolved in the States' favor on 24 December 1980. By letter dated 12 January 1981, the State of Maryland certified that the facility at Hart-Miller Islands would be provided as a disposal area and thus finalized the requirements of local cooperation for Maryland.

18. By letter of 24 April 1981, the Maryland Department of Transportation (DOT) and the Commonwealth of Virginia agreed to provide disposal areas for the Virginia portion of the project. Additionally, by another letter of 24 April 1981 to DOT, the Commonwealth certified that there was a water control agency in place to establish standards to regulate water quality in Virginia waters, and that the Commonwealth will comply with Title VI of the Civil Rights Act of 1964.

19. By letter dated 28 April 1981, the State of Maryland submitted a revised letter of intent which agreed to provide local cooperation for the entire project. The State also inclosed the 24 April 1981 letters from the Commonwealth of Virginia.

PERTINENT CORRESPONDENCE

20. Pertinent correspondence received from agencies, and the public, and responses to the comments are included in Addendum II, Public Views and Comments.

SECTION K

ENVIRONMENTAL ANALYSIS

PROFILE OF EXISTING CONDITIONS

GEOLOGY AND SEDIMENTS

1. Chesapeake Bay is located in the Atlantic Coastal Plain physiographic province. This province is characterized by thick sequences of sand, silts, and clays overlying crystalline bedrock. From their western terminus at the fall line the deposits dip in a seaward direction toward the Atlantic Ocean and continue beneath the ocean where they form the continental shelf. The regional dip is such that bedrock outcrops in some areas of Baltimore whereas the depth to bedrock at the southern portion of the Bay, near Cape Henry, Virginia, is more than 2,000 feet. Extensive erosion during the Jurassic period removed any previous sediments above the bedrock basement. It is now overlain by geologically unconsolidated marine sediments dating from the Cretaceous, Tertiary, Pleistocene, and Recent periods. The older sediments are generally bedded parallel to the bedrock surface; however, younger sediments dip at a less steep angle than does the bedrock so as to create a succession of wedge shaped layers.

2. After deposition of the Tertiary soils and during the Pleistocene, the sea level fluctuated with respect to the land due to the formation and melting of glaciers, and possibly as the result of the elevation and depression of the land surface. Evidence that sea level at one time was approximately 250 feet lower than at present is clearly recorded in the ocean floor east of the Chesapeake Bay. Therefore, the upper part of the Tertiary soils were at one time above sea level and subject to erosion so that only the Cretaceous and older Tertiary soils remain. The major rivers, such as the Susquehanna, cut deep channels during the Pliocene when the land surface was higher than at present. The channels were widened during the Pleistocene, and finally flooded, creating broad shallow bays of which Chesapeake Bay is an example. Submergence of the river valleys caused them to become filled, possibly first with Pleistocene sand and gravel terrace deposits, then with soft clays and silts during Recent times. Thus, a characteristic subsurface feature of the Bay is a relatively shallow buried erosional surface which represents the interface between the looser and softer Pleistocene and Recent deposits and the older, more compact pre-Pliocene deposits.

VIRGINIA CHANNEL SECTIONS

3. The overall geologic profile includes a buried erosional surface whose depressions are filled with soft silts and clays and occasionally layers of medium compact fine sand which is believed to be Recent or Pleistocene age. Studies have shown that the boundary between the erosional surface and overlying sediments represents the top of the Tertiary deposits, which in this area are of the Miocene age. These soils are greenish gray in color and consist of fine sandy clay, silty clay containing some fine sand and silty fine sand, all containing at least a trace of shells, and in some cases definite shell beds. These soils were consolidated through dessication at a time when the land was elevated

with respect to the sea and are presently stiff to very stiff or medium compact to very compact. However, the Pleistocene and recent soils overlying the Tertiary are only consolidated under the weight of their existing overburden or possibly slightly more as a result of local drying. In the vicinity of the York Spit Channel, the subsoil stratigraphy to the depths relevant to this project are as follows: From the Bay bottom at elevation -52 to elevation -72, the borings encountered a loose to medium compact gray fine sand, some silt, and trace shells. The surface of the Tertiary soils began at elevation -72 and consisted of stiff to very stiff green, gray fine sandy clay, some silt and trace shells.

MARYLAND CHANNEL SECTIONS

4. Borings indicate that the surface of Cretaceous soils lies at a much higher elevation than to the south. These soils are all hard or very compact silty to clayey sands, which probably belong to the Patuxent Formation. The interpretation of the generalized soils profile indicates that harbor bottom deposits of varying thickness are underlain by estuarine deposits across the width of the harbor. The harbor bottom deposits contain decomposed organics and petroleum residue, while the estuarine deposits are soft to stiff organic clayey silts or organic sandy silts. Underlying these materials is a stratum of compact to very compact silty sand to gravelly sand. The surface of this stratum varies extensively even over local areas but it is generally below elevation -60.

5. For detailed geology and sediments in reaches of the authorized channel deepening, refer to Section H for a summary of Appendix B.

CHEMICAL ANALYSIS

6. During 1972, the Virginia Institute of Marine Sciences (VIMS) performed an intensive sediment sampling and analysis study of the Baltimore Harbor Channels in Virginia under contract to the Norfolk District of the United States Army Corps of Engineers. The results of that study may be found in Appendix C. During 1977 and 1978, VIMS performed a similar study under contract to the Baltimore District (Appendix D). This later study included sampling in the new channel areas and potential overboard disposal areas - areas not investigated in 1972. While repeating parameters from the earlier study, new parameters were added by suggestion of the Technical Advisory Group. Both studies included surface sampling and sampling beyond project depth by vibracore borings. The 1978 study also included both deep and surface sampling from the project channels in Maryland, and elutriate analysis for all proposed overboard disposal areas.

7. Material to be dredged from project channels in Virginia have been found to contain low levels of all parameters tested when compared with guideline levels recommended by the Spoil Disposal Criteria Committee, a group established by the State of Maryland, to identify dredged material potentially unsuitable for overboard disposal. The Environmental Protection Agency, Region III, recognizes these guideline levels as reasonable and adequate when applied to disposal of dredged materials in the waters of the Chesapeake Bay. Results of elutriate analyses performed for the dredging and disposal areas showed little affect upon ambient water quality.

8. Sediments tested by VIMS in Maryland waters during 1978 (Appendix D) revealed the pattern demonstrated by a study of Baltimore Harbor sediments conducted by the

Environmental Protection Agency during 1971, and by the yearly testing performed on the approach channels to the harbor prior to maintenance dredging. This pattern consists of a grossly polluted surface layer of sediments within the inner harbor, diminishing in level of contamination as the harbor mouth is approached, and finding sediments in the project channels in the Bay suitable for open water disposal.

HYDRODYNAMIC AND HYDROLOGIC CHARACTERISTICS

9. Chesapeake Bay is a complex, dynamic system. Average maximum tidal currents range from 0.5 knots to over 2 knots (1 knot equals 1 nautical mile of 6,076 feet per hour). Except during periods of unusually high winds, waves in the Bay are relatively small, generally less than 3 feet in height. The mixing in the estuary of sea water and freshwater creates salinity variations within the system. In the Chesapeake Bay, salinities range from 33 parts per thousand at the mouth of the Bay near the ocean to near zero at the north end of the Bay and at the heads of the embayments tributary to the Bay. Generally speaking, the annual temperature range in Chesapeake Bay is between 0 degrees Centigrade and 29 degrees Centigrade. Because the mouth of the estuary is close to the sea, it has a relatively stable temperature as compared with the upper reaches. Dissolved oxygen levels vary considerably both seasonally and according to depth. During the winter, the Bay is high in dissolved oxygen content. With spring and higher water temperatures, the dissolved oxygen content decreases. While warmer surface waters stay near saturation, in deeper waters the dissolved oxygen content becomes significantly less.

TIDES

10. The mean tidal fluctuation in Chesapeake Bay is small, generally between 1 and 2 feet. The mean range of tide is 2.8 feet at the Cape Henry Channel, 2.3 feet at the York Spit Channel, 1.4 feet at the Rappahannock Shoal Channel, 0.8 foot at the Craighill Entrance, 0.9 foot in the Cutoff Section, 1.1 feet at Fort McHenry, and 1.2 feet at Poole's Island in the upper Chesapeake Bay. Fluctuations in the water surface elevation in Baltimore Harbor caused by lunar tides are insignificant when compared with the fluctuations resulting from weather conditions. Prolonged high winds from the north have a tendency to blow water from the bay and cause unusually low tides. Strong winds from the south have the opposite effect. Serious flooding has been a recurring phenomena in the Chesapeake Bay Region. Generally, these floods have been caused by either hurricanes or slightly lesser storms known as "northeasters." It has been the Bay Region's good fortune not to have experienced a major tidal storm for a number of years. During this time, development within the flood plain has intensified. The attractiveness of the shore environment has caused continued development of large tracts of land adjacent to the Bay for residential as well as commercial and industrial purposes. Thus, the potential for increased loss of life and property, hazards to health, disruption of normal economic activities, and the cost of evacuation and rehabilitation will be greater than those as experienced in past floods.

11. To date, over 100 damaging storms, including 53 hurricanes and 47 northeasters, have been reported in the Bay Region, from the time data has been collected on the Bay until present, over 100 damaging storms. Each hurricane covered a large geographical area and had winds in excess of 75 miles per hour moving in a counterclockwise direction. The northeasters had lesser wind speeds but often covered

an even larger area. Both types of storms may cover the entire Bay Region at one time and although all parts of the Study Area have at some time been damaged by such a storm, the Norfolk area, due to its exposed location, is one of the centers of the highest frequency.

CURRENTS

12. Average maximum Tidal currents range from 0.5 knots to over 2.0 knots. The velocity of the flood current varies in strength from about 1.0 knot at the entrance to Chesapeake Bay to about 0.6 knot at the Craighill Entrance Channel. The velocity of the ebb current varies from about 1.5 knots at the entrance to the bay to 0.7 knot in the Craighill Entrance. A vessel entering Chesapeake Bay at a speed of 12 knots can pass Cape Henry two or three hours before high tide at that point and carry a favorable tidal current all the way to Baltimore. A vessel leaving Baltimore at the same speed at high tide can carry a favorable tidal current almost two-thirds of the way to Cape Henry.

SALINITY

13. Within the Bay proper, and its major tributaries, there is superimposed on the tidal currents a less obvious, non-tidal, two layered circulation pattern that provides a net seaward flow of lighter, lower salinity water in the upper layer and a flow up the estuary of heavier, higher salinity waters in the deeper layer. The tidal currents provide some of the energy necessary for the mixing of the two layers. The mixing in the estuary of sea water and freshwater creates salinity variations within the system. Salinity patterns also vary seasonally according to the amount of freshwater inflow into the Bay system. Due to this seasonal variation in salinity and the natural density differences between fresh and saline waters, significant non-tidal circulation often occurs within the Bay's small tributary embayments. In the spring, during the period of high freshwater inflow to the Bay, salinity in the embayments may be greater than in the Bay. Because of this salinity difference, surface water from the Bay flows into the tributaries on the surface, while the heavier, more saline bottom water from the tributaries flows into the Bay along the bottom. As Bay salinity becomes greater through summer and early fall, Bay waters flow into the bottom of the tributaries, while tributary surface waters flow into the Bay. In addition, the Baltiomre Harbor contains a three-layer circulation pattern which consist of a fresh top layer and a saline bottom layer, both of which flow into the harbor and a mixed middle layer which flows out of the harbor.

14. The salinity of Chesapeake Bay ranges from slightly below that of the open ocean at the Virginia Capes to freshwater at the Susquehanna flats in the upper bay. At Baltimore, the surface salinity varies from an average of 5 parts per thousand in the spring to about 10 parts per thousand in the fall. At the mouth of the Potomac River the surface salinity varies from 11 to 18 parts per thousand, while at Cape Henry it varies from 23 to 29 parts per thousand.

15. The Baltimore Harbor Channels are located in the mesohaline (5-18 ppt salinity) ecological zone near its transition with the oligohaline (0.5-5 ppt salinity) zone. These salinity zones are shown on figure K-1. There is a longitudinal salinity gradient which may undergo significant variations dependent on the amount of freshwater inflow from the Susquehanna River. During a wet period such as may occur in the spring, the salinity might be 3 ppt at the mouth of the Patapsco River and 6 ppt at the Bay Bridge. During

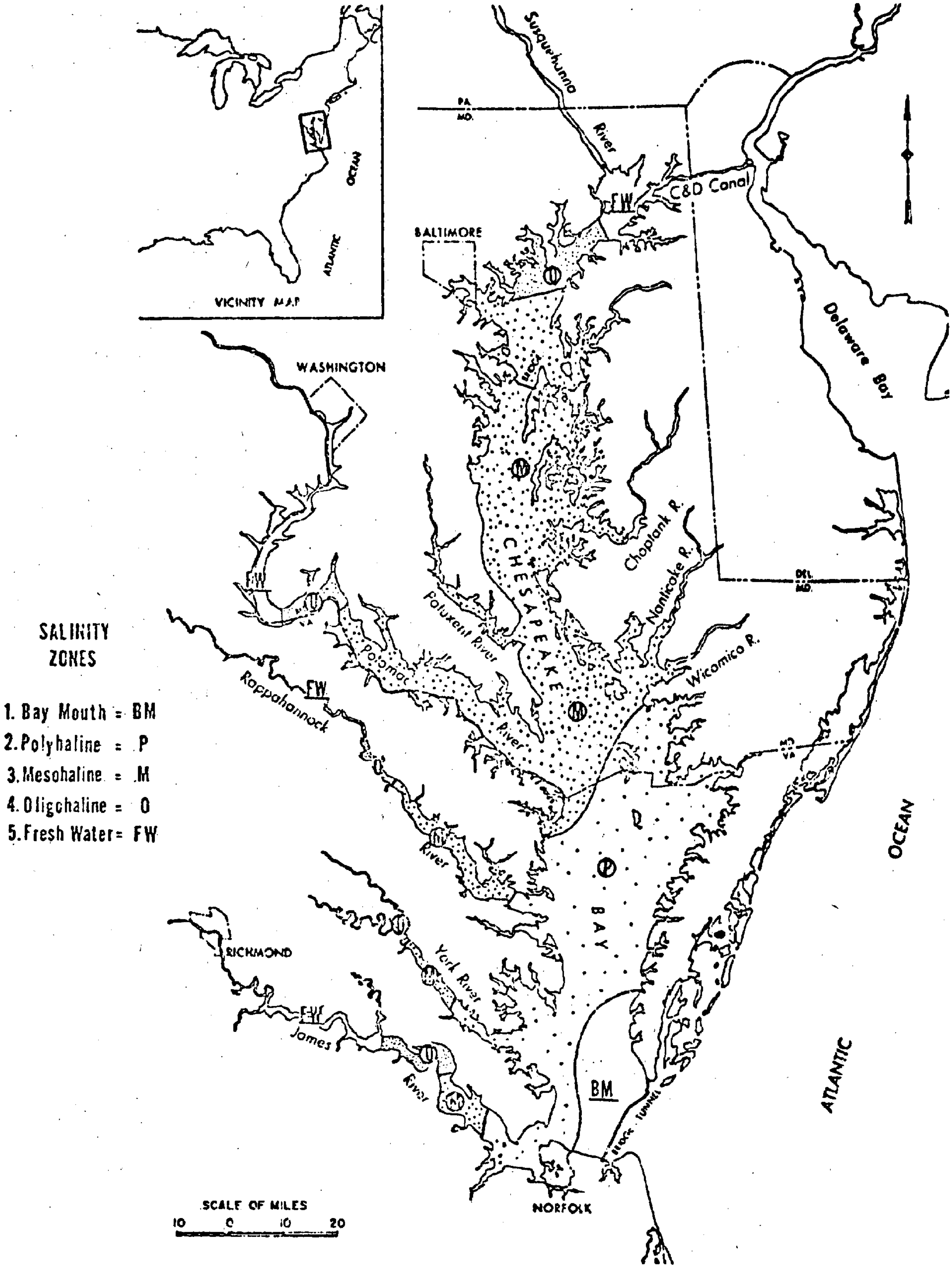

VICINITY MAP
OCEAN
ATLANTIC
Susquehanna
River
PA.
MD.
FW
C&D Canal
BALTIMORE
Delaware Bay
WASHINGTON
CHESAPEAKE
Choptank R.
Nanticoke R.
Wicomico R.
DEL.
MD.
Patuxent River
Potomac
River
Rappahannock
River
FW
BAY
MD.
VA.
OCEAN
ATLANTIC
RICHMOND
York River
James
River
BM
NORFOLK
SALINITY
ZONES
1. Bay Mouth = BM
2. Polyhaline = P
3. Mesohaline = M
4. Oligohaline = O
5. Fresh Water = FW
SCALE OF MILES
10 0 10 20

FIGURE K-1

dry periods such as tend to happen in the fall, the salinity might increase to 8 ppt at the mouth of the Patapsco River and as much as 13 ppt at the Bay Bridge.

16. The three Virginia channels occupy the lower third of the Bay and are within the "polyhaline" (18-30 ppt salinity) ecological zone of the estuary. The longitudinal salinity gradient varies from close to 30 ppt at Cape Henry to approximately 19 ppt at the upper Rappahannock Shoal Channel. During periods of high freshwater river discharge, the salinities in the upper waters may drop as much as 5 ppt.

TEMPERATURE

17. The effects of temperature on the estuarine system are extremely important as it affects biological processes and causes variations in water density, which plays a role in stratification and non-tidal circulaion. Since the waters of Chesapeake Bay are relatively shallow compared to the ocean, they are more affected by atmospheric temperature conditions. Generally speaking, the annual temperature range in Chesapeake Bay is between 0 degrees Centigrade and 29 degrees Centigrade. Because the mouth of the estuary is close to the sea, it has a relatively stable temperature as compared with the upper reaches.

DISSOLVED OXYGEN

18. Dissolved oxygen is another important physical parameter. Dissolved oxygen levels vary considerbly both seasonally and according to depth. During the winter the Bay is high in dissolved oxygen content since oxygen is more soluble in cold water than in warm. With spring and higher water temperatures, the dissolved oxygen content decreases. While warmer surface waters stay near saturation, in deeper waters the dissolved oxygen content becomes significantly less despite the cooler temperatures because of increasing oxygen demands (by bottom dwelling organisms and decaying organic material) and decreased vertical mixing. Through the summer, the waters below 30 feet become oxygen deficient. By early fall, as the surface waters cool and sink, vertical mixing takes place and the oxygen content at all depths begins to steadily increase until there is an almost uniform distribution of oxygen.

TRIBUTARY DRAINAGE

19. The source of fresh water for the Chesapeake Bay is runoff from a drainage basin covering 64,160 square miles. Approximately 88 percent of this basin is drained by five major rivers - the Susquehanna, Potomac, Rappahannock, York and James. These river basins are subject to periodic large, climatic extremes, resulting in large fluctuations in flow, i.e., droughts and floods. Of these, droughts are the more geographically widespread and long-term in nature.

20. Major floods on rivers in the Chesapeake Bay Basin may occur during any season of the year. Usually, however, not all rivers are affected by any one storm due to the areal extent of the Bay Basin.

WATER QUALITY

21. Water quality conditions in the Chesapeake Bay Area vary widely due to a variety of factors, e.g., proximity to urban areas, type and extent of industrial activity, streamflow characteristics, amount and type of upstream land and water usage, and various non-point sources of pollution.

22. Water quality as a whole in Chesapeake Bay is good. In the upper portion of the Bay, nutrients carried by Susquehanna River waters, largely as a result of runoff from extensive fertilized agricultural areas and the wastewater discharges of over a million people, appear to be the major problem. Depression of dissolved oxygen (DO) concentrations below Conowingo Dam, located near the mouth of the Susquehanna River, following late summer deep water discharges, causes occasional fish kills. In the middle and lower Chesapeake Bay, water quality is good with most of the problems occurring in the tributaries and near areas of high population concentration.

23. In the Patapsco River and especially the Baltimore Harbor Area, analysis of the water quality has indicated that many sources of pollution exist. Among these are wastewater discharges, direct indistrial discharges, sewerage overflows and leaks into the harbor tributaries, urban runoff, and spills of hazardous substances from vessels and dockside facilities. Major problems include low DO content, high bacterial concentrations, and undesirable levels of other pollutants such as heavy metals and oil. Field investigations during December 1971 by the EPA Annapolis Field Office, identified significant industrial discharges of ethion (pesticide), cyanide, phenol, nutrients, and various heavy metals into Baltimore Harbor. Although nutrient concentrations are generally sufficient for algal blooms they rarely occur. DO concentrations at the surface have generally conformed with existing standards, while values at the 15-foot level are frequently depressed below the standard (concentrations may be not less than 5.0 mg/liter at any time with a minimum daily average of not less than 6.0 mg/liter).

24. Groundwater quality is variable with each aquifer within the study area, however, the only areas of significant groundwater withdrawal are the Annapolis and Baltimore metropolitan areas. Since the Annapolis area will not be affected, only the Baltimore area is discussed.

25. The Baltimore industrial area has a long history of domestic, industrial, and municipal use of groundwater. This use probably peaked during World War II when use was so great (estimated 40 million gallons per day industrial withdrawal) that salt water intrusion became a serious problem. The probable maximum water table decline was during World War II. It is believed that levels have generally risen since that time, although in some areas industrial pumping has created cones of depression below sea level.

AIR QUALITY

26. Generally, air quality may be considered good due to the mainly rural character of the study area. Air quality diminishes with proximity to the metropolitan areas, e.g., Baltimore and Washington, which usually conflict with two of the six air quality parameters monitored by the Environmental Protection Agency. The two parameters are particulates and photochemical oxidants.

27. Locally, particulates in the air originate from industrial sources and construction activites generating fugitive dust. Photochemical oxidants stem from the interaction of the ultraviolet component of sunlight with the hydrocarbons released to the atmosphere through automobile emissions.

28. Elaboration of air quality standards and data were not carried out due to the limited relationship to the project.

CULTURAL RESOURCES

29. A major theme of the Colonial Period in the Chesapeake Bay is the central importance of waterborne transportation to the area's maritime cultural system. Watercraft served as the means whereby the Europeans came to the Bay area, and upon which their economy became dependent.

30. Although it is not entirely clear when European explorers first came to Chesapeake Bay, it has been speculated that the Bay was visited by Norsemen as early as the 11th Century. The most prominent explorers of the 16th and 17th Century were the Spanish. Towards the end of the 16th Century, the English became interested in colonizing the New World, establishing Jamestown in 1607.

31. The spread of the English Colonial settlement in the early decades of the 17th Century brought disease and defeat to the American Indian tribes in the Chesapeake Bay area. Within a relatively short time their surviving members withdrew from the Chesapeake Bay to more remote areas, or remained and adapted themselves to the ever expanding and dominant European culture.

32. The waterborne transportation system became a central factor both in internal communications in the Bay, and in commerce with Europe and other areas. By 1622 tobacco had become the major cash crop in the Bay area's economy. The amount of maritime traffic on the Bay steadily increased during the 18th Century as the region's economy expanded along with the emergence of the American merchant marine and the Baltimore clipper sailing schooner. By the end of the 18th Century, the Chesapeake Bay had become a major shipbuilding center.

33. The Chesapeake Bay was a major theater of operations during the War of Independence, War of 1812, and the Civil War naval and military operations.

34. During the 19th Century, steam-powered vessels were introduced into the Bay's maritime commerce. Despite the introduction of steam-powered vessels, a major portion of the Bay's maritime traffic still relied primarily on sails. Following the end of the Civil War, the Bay's maritime trade expanded. The port of Baltimore continued to be a center of both transportation and industry.

ECOLOGY

35. The Chesapeake Bay Area comprises open water, marshes and other wetlands, and uplands. Approximately 22 percent of the Bay Area is classified as open water, 71 percent as uplands, and 7 percent as wetlands. It is the 29 percent wetted area total that will be addressed as to the effect of project activities.

WETLANDS

36. Wetlands are infinitely varied, complexly integrated areas of plant and animal communities. Although each wetland type is unique, similarities exist which enable these types to be divided into the following three major wetland categories: coastal saline, coastal fresh, and inland fresh. These three wetland categories total approximately 1,145,000 acres and are located in both the drainage basins and the Bay proper.

37. Coastal saline wetlands are generally located in coastal areas that are in direct contact or are indirectly affected by saline waters. These marshes provide extremely high quality nursery areas for both sport and commercial fishes and their value as habitat for many wildlife species is great.

38. Coastal fresh wetlands are located in coastal areas that are affected by tidal fresh water. While the primary production of coastal fresh wetlands may not be as great as coastal salt wetlands, the wildlife habitat they provide is of greater value and more extensively utilized. This is primarily due to the array of vegetation types characteristic of these wetlands.

39. Inland fresh wetlands include those areas usually characterized by non-tidal fresh water. While primary productivity is not relatively great, the wide variety of vegetation found in this wetland category makes it of extreme value to numerous wildlife species.

40. Recognizing the beneficial role that wetlands play in natural processes, Executive Order 11990 was promulgated to assure their protection against long and short-term impacts. As there are no wetlands located within project construction areas, no further impact assessment was conducted.

SUBMERGED VASCULAR PLANTS

41. Submerged vascular plants are widely distributed in the Bay and tributaries wherever shallow, quiet, and relatively clean waters are present. Relatively healthy plant populations are found in the eastern shore tributaries such as the Choptank, Nanticoke, and Chester Rivers. The western shore of Patuxent River is also highly productive. The Eastern shore from the Bay Bridge to Pocomoke Sound is highly productive, particularly in the shallow waters around islands such as Bloodsworth and Smith. These plants play an important role in bottom stabilization, water oxygenation, providing shelter and food for young fish, and food for wildfowl. Because they are limited to relatively shallow areas where light can penetrate to the bottom, it is not likely that there are productive beds of submerged aquatic vegetation in close proximity to the channels or deep water disposal sites (see Figures L-1 through L-3); nor is there any marsh land nearby.

WATERFOWL

42. Chesapeake Bay is the constricted neck in the gigantic funnel pattern that forms the Atlantic Flyway. Most of the waterfowl reared in the area between the western shore of the Hudson Bay all the way to Greenland spend some time in the marshes of the Bay and its tributaries during their migrations. Good wintering areas adjacent to preferred upland feeding grounds attract more than 75 percent of the wintering population of Atlantic Flyway Canada geese. The marshes and grain fields of the Delmarva Peninsula are particularly attractive to Canada geese and to grain-feeding mallards and black ducks. The Susquehanna Flats support huge flocks of American widgeon in the early fall, while several species of diving ducks, including canvasback, redhead, ringneck, and scaup, winter on Chesapeake Bay from the Susquehanna Flats south to the tip of the Delmarva Peninsula. About half of the 80,000 whistling swans in North America winter on the small estuaries in or around the Bay. While this area is primarily a wintering ground, several other species of waterfowl, including the black duck, blue-winged teal, and wood duck, find suitable nesting and brood-raising habitat.

plovers, marsh hawk, short-eared owl, herons, egrets, gulls, terns, oyster catcher, and curlews. Many of the above species are insectivores, feeding on grasshoppers, caterpillars, beetles, flies, and mosquitoes, while others feed on seeds, frogs, snakes, and fish. There are numerous other birds which rely more heavily on the wooded uplands and agricultural lands providing their basic habitat requirements. Among these species are many game birds, including wild turkey, mourning dove, bobwhite quail, woodcock, and pheasant. In addition, migratory and resident songbirds and birds of prey are primarily upland species. It should be emphasized that some of these species require both an upland and a wetland habitat.

PHYTOPLANKTON

44. The greatest amount of accumulated information regarding the phytoplankton of Chesapeake Bay concerns the diatoms and dinoflagellates, whereas virtually nothing is known of the nannoplankton.

45. In the seasonal cycle of the Bay, phytoplankton diatoms occur throughout the year. Generally, they are most abundant in the fall, winter, and spring period when water temperatures are below 20 degrees Centigrade. However, temperature does not necessarily seem to an important indicator of population density. Other parameters such as nutrients, day length, and turbidity are probably more significant. Planktonic diatom populations in the lower Bay are generally more diverse with a mixing of estuarine and marine or oceanic species.

46. Although dinoflagellates, as evidenced by the summer red water blooms throughout the Bay, are most abundant at water temperatures above 20 degrees Centigrade, exceptions are fairly common. The armoured dinoflagellates persist in the Bay throughout the seasonal cycle while the naked forms are most common during the summer months. All range throughout the Bay, but successional species changes occur from lower to upper Bay. Silocoflagellates occur primarily during the spring period, although they contribute a relatively small amount to the total biomass, whereas the nannoplankton are most abundant in the summer. This last group has generally been neglected because of the difficulties in identification and preservation. The microscopic green and blue-green algae, which are becoming increasingly more abundant in the upper reaches of Bay tributaries, are common constituents of the spring, summer, and fall phytoplankton community.

BENTHIC INVERTEBRATES

47. Benthic invertebrates of the polyhaline zone in the lower Bay exhibit a high diversity and a distribution pattern which is largely determined by the patterns in bottom sediment type. The benthic invertebrates play an essential role in the aquatic food web by serving as food sources for a large variety of species in higher tropic levels.

48. The distribution and abundance of fauna in Baltimore Harbor is quite distinct from that of the Bay due to the impact from the large harbor industrial complex. Benthic biomass values are significantly less than at reference stations. The principal reason for the paucity of benthos is the fact that the sediments are grossly contaminated with a number of pollutants. In addition to the large amount of chemical pollutants, the harbor also has high concentrations of coliform bacteria and associated organisms.

FISH AND SHELLFISH

Finfish

49. The Chesapeake Bay serves as a nursery and spawning ground for fish caught from Maine to North Carolina. The Northern part of the Chesapeake Bay, including the C&D Canal, is probably the largest of all spawning areas in the Bay. This area plus the upper tidal portions of the Potomac, York, Rappahannock, James, and Patuxent Rivers, represent about 90 percent of the anadromous fish spawning grounds in the Bay.

50. The utilization of Baltimore Harbor as spawning habitat is very limited. The harbor is, however, used as a nursery and feeding ground by several fish species, white perch being the most abundant, although many show signs of stress. Several bottom dwelling species are conspicuously absent, probably due to the polluted nature of the bottom sediments.

51. Some of the fish that use the Bay as a nursery include the striped bass, weakfish, shad, alewife, blueback herring, croaker, menhaden, and kingfish. A variety of prominent freshwater and marine finfish in the Bay include such species as the spot, seatrout, flounders, yellow perch, white perch, catfish, and sunfish. A large number of desirable sport fish species are found in the Bay at various times and places, with about a dozen being of principal interest. There is virtually no tidewater zone that does not have an abundance of some sought-after species. Types of fishing range from dip netting for river herring at the head of the Bay to deep fishing for large drum in the southern section.

52. In the spring, heavy runs of river herring and white perch occur in the streams flowing into the Bay. Centers of intensive spring fishing are on the Susquehanna Flats, the Choptank River, and Allen's Fresh in Charles County.

53. The upper Bay supports both a commercial and a large sport finfish fishery. The harvests of selected species for areas of the upper Bay (Figure K-2) are shown in Table K-1.

54. The mid-Bay area is heavily fished for striped bass and white perch during the summer months with the total weight of all species taken in estimated to be around two million pounds. The lower Bay, and particularly Tangier Sound, attracts heavy fishing for the large red drum and black drum that move into the area in the spring.

55. There is generally good year-round fishing throughout the Bay, with the species caught varying with the time of year and method of fishing. While heavy fishing occurs in the Bay proper and the Potomac Estuary, there is also a great deal of activity in the tidal portions of the numerous small tributaries of the Bay where several fresh water species such as smallmouth and largemouth bass, northern pike, and crappies are caught along with the more typically saltwater species. Other species of game fish caught include, bluefish, weakfish, spot, cobia, flounder, and croaker.

Figure K-2
1976 Survey areas
and sampling points

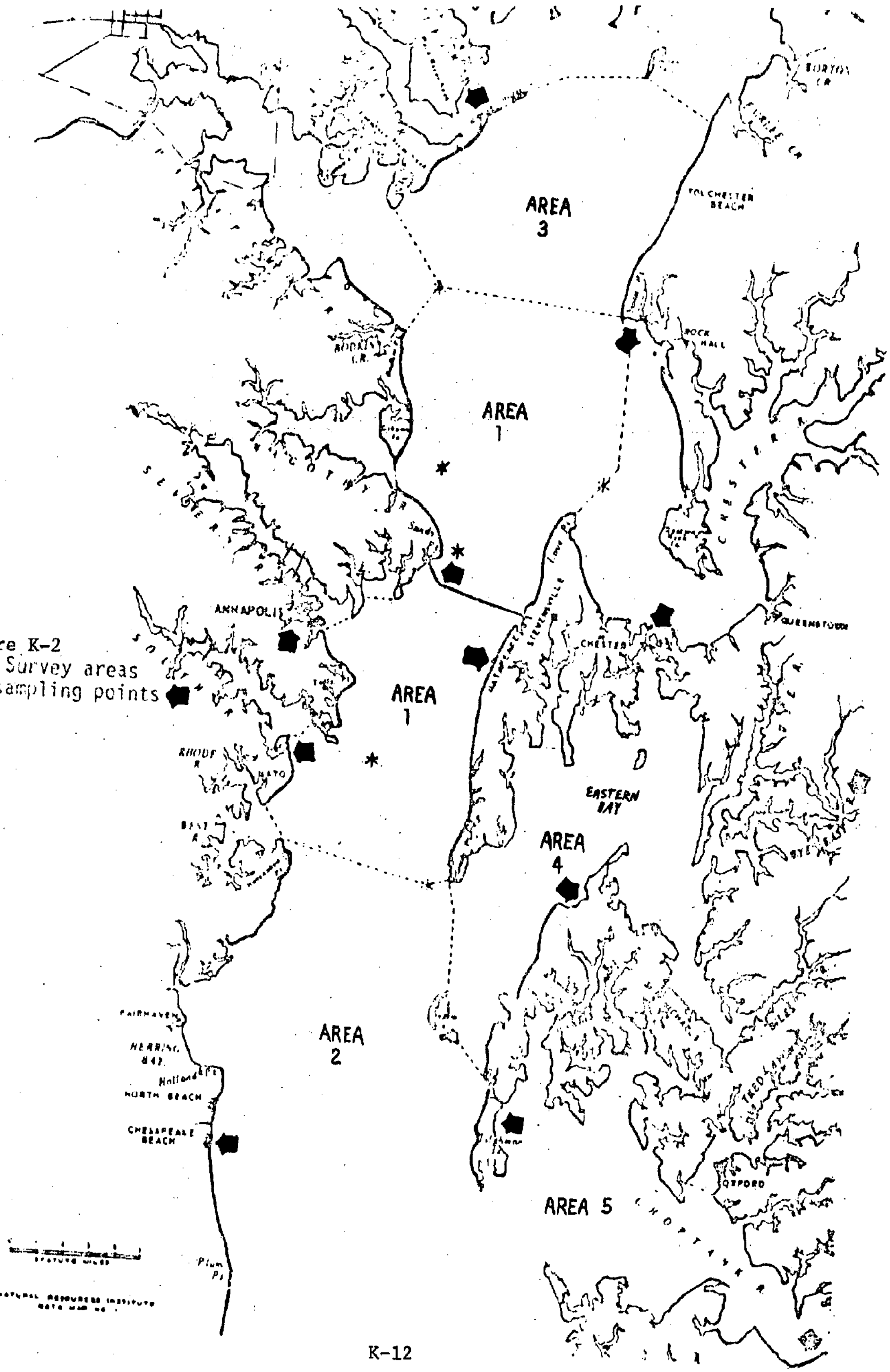


Table K-1 Comparison of sport and commercial catch within sport fishing survey areas for 1976.

	Harvest in pounds by species				
	Striped bass	Bluefish	White perch	Croaker	Spot
Area 1 - sport	500,286	766,402	68,930	4,947	5,364
commercial	138,589	76,554	17,373	30	117
Area 2 - sport	21,966	2,067,722	2,727	1,589	5,265
commercial	114,224	44,937	8,554	21	84
Area 3 - sport	3,712	19,421	141,012	19	5,990
commercial	181,010	35,421	22,732	0	0
Area 4 - sport	6,879	40,551	28,012	0	525
commercial	9,316	734	9,669	0	0
Area 5 - sport	2,958	21,091	25,595	4,134	1,708
commercial	38,040	1,524	16,390	0	0
Totals sport	535,800	2,915,179	266,274	10,689	18,853
commercial	481,179	159,170	74,718	51	201
Entire Maryland Chesapeake Bay & tidewater tributaries (exclusive of Potomac River) commercial finfish harvest	1,452,289	398,055	392,232	8,313	1,090

Source: Speir, et al., 1977

56. Generally speaking, the commercial uses of the Bay's fishery resources are intensive, abundant, and varied. Commerical fishing for industrial fishes (primarily menhaden) is at, or surpassing, maximum sustained harvest capability levels. Therefore, the industrial fish harvest cannot be expected to appreciably increase in the future. Major finfish caught on a commercial basis in the study area include menhaden, alewives, striped bass, shad, catfish, spot, croaker, and other species that are fished somewhat less extensively.

57. Except for certain species, the edible finfish harvest has not yet reached its maximum sustained harvest capability level. Based on catch records and professional opinion, it appears that American shad are currently harvested to the maximum sustained level. Adequate information is not available to determine the variance in composition and the maximum sustained harvest rates for certain fish species. This is particularly true of white perch, yellow perch, catfish, and swellfish, and to a lesser degree, weakfish, butterfish, flounder, bluefish, spot, and other species.

Shellfish

58. The most economically important species of shellfish are the oyster, blue crab and the softshell clam. Virginia is the nation's leading producer of blue crabs and Maryland leads the nation in the production of softshell clams and oysters.

59. Oysters are abundant in many parts of the Estuary. The numerous small bays, coves, and inlets between the Chester and Nanticoke Rivers along the Eastern Shore and the lower portions of the Patuxent, Potomac, York, Rappahannock, and James Rivers account for approximately 90 percent of the annual harvest of oysters in the Bay.

60. Chartered oyster bars in the vicinity of the Baltimore Harbor approach channel are shown in Figures K-3 and K-4. Although all these bars are open to public harvest, some are no longer productive. The records of commercial harvest of soft clams from the Bay waters in the vicinity of the Baltimore Harbor approach channel are shown in Table K-2. In general, most soft clams are found in waters less than 20 feet deep.

61. Oysters, (Crassostrea virginica) comprise an important commercial fishery in Virginia. Since they are most abundant in waters less than 25 feet deep and occur infrequently in waters greater than 35 feet deep, it is unlikely that productive oyster bars are located close to the channels or deep water disposal sites.

62. Commerical harvesting of hard clams (Mercenaria mercenaria) is centered primarily in the Bay tributaries. Although the clams occur throughout the lower Bay, their concentrations are apparently only high enough to support a modest commercial fishery there. There are likely to be scattered populations of hard clams in the Virginia channels, particularly in Cape Henry and York Spit and possibly in the disposal sites.

63. In the lower Bay, the largest commercial fishery is for blue crabs (Callinectes sapidus). The mouth of the Bay, an area of high salinity, is the major source of blue crabs harvested in the Bay and its tributaries. Harvesting occurs on a year round basis and includes a winter dredging fleet. Female crabs migrate south during the late summer and fall to the higher salinity waters of the lower Bay. The adult females pass the winter in the deeper portion of the lower Bay, an area which includes the York Spit and Cape Henry channels. During the spring, the crabs move into shallower water, where they will

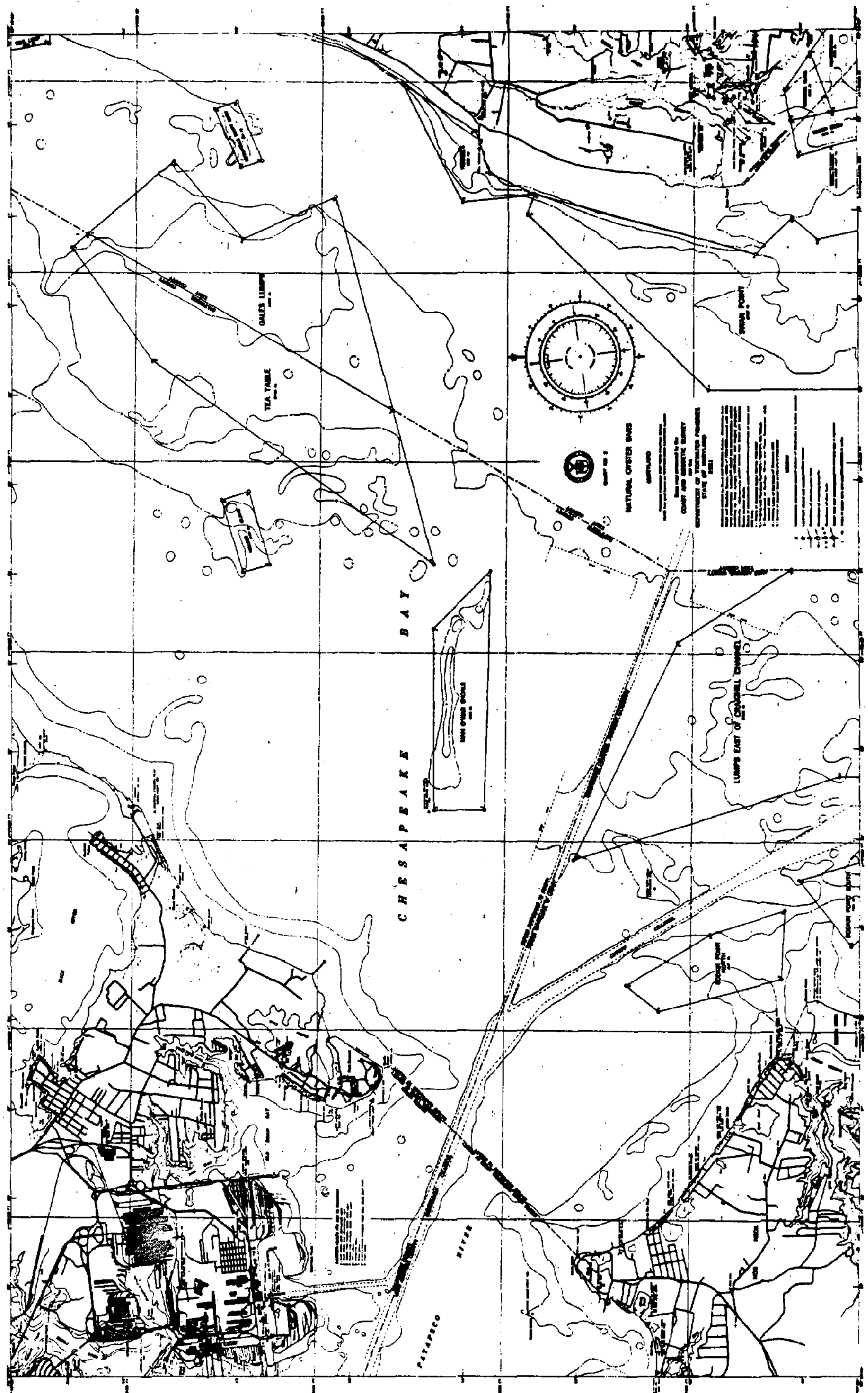


FIGURE K-3

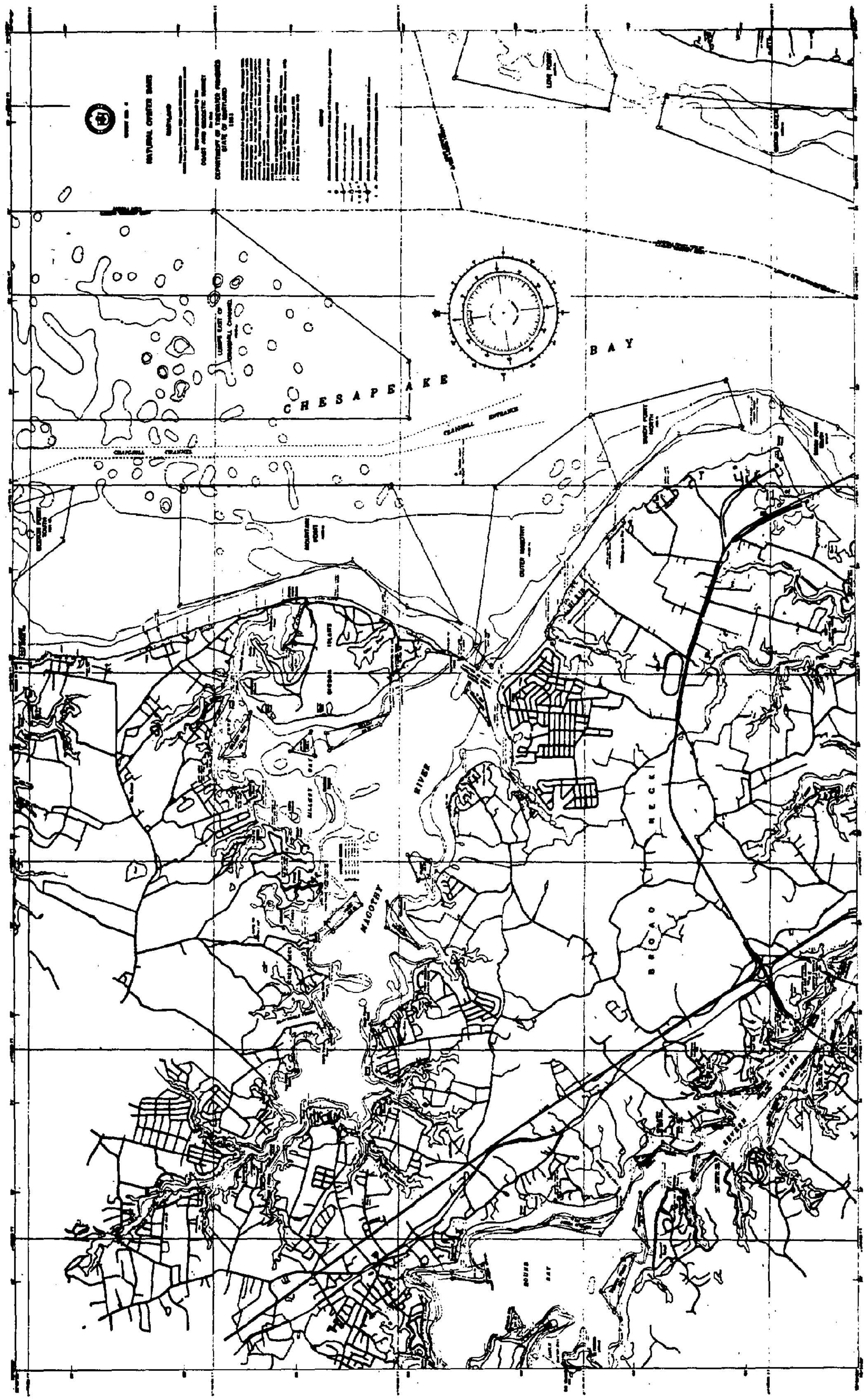


FIGURE k-4

Table K-2 Port Softshell Clam Harvest In Bushels From Upper Chesapeake Bay Waters[1]

County	66-67[2]	67-68	68-69	69-70	70-71	71-72	72-73	73-74	74-75	75-76
Queen Annes	7,862	1,708	19,230	11,288	40,552	22,011	58	323	10,213	2,994
Kent	7,550	6,613	7,575	16,085	19,075	32,235	0	103	2,999	1,804
Anne Arundel	10,654	1,446	3,600	626	242	0	0	29	37	0
Baltimore	0	0	0	0	0	0	0	0	0	0

[1]Excludes the Chester River

[2]Harvest from July of the first year to June of the following year

spawn in late spring and summer. After hatching, the zoeae larval stage remains planktonic for about 6 weeks. The greatest concentrations of zoeae occur between Cape Charles and Cape Henry in the upper water levels in the vicinity of the channel, with lesser numbers up-Bay and seaward. As they pass through the megalopa stage and into the young crab stage, they settle to the bottom and migrate up-Bay.

64. There is a very minor commercial fishery during the winter for rock crabs (Cancer irroratus). Rock crabs move into the lower Bay from the Ocean in mid-November and depart in April. They are found east of the Bay Bridge-Tunnel and the lower York Spit.

THREATENED AND ENDANGERED SPECIES

65. The following include a total of 3 threatened and 11 endangered species which occur or possibly occur in the Chesapeake Bay Area.

List of Species	Status
Bald Eagle	Endangered
Bog Turtle	Threatened
Maryland Darter	Endangered
Shortnose Sturgeon	Endangered
Delmarva Peninsula Fox Squirrel	Endangered
Eskimo Curlew	Endangered
Arctic Peregrine Falcon	Endangered
Kemp's Ridley Turtle	Endangered
Leatherback Turtle	Endangered
Hawksbill Turtle	Endangered
Loggerhead Turtle	Threatened
Green Turtle	Threatened
Red-Cockaded Woodpecker	Endangered
American Peregrine Falcon	Endangered

66. Of these species only the Kemp's Ridley, Leatherback and Hawksbill Turtles, and Shortnose Sturgeon may potentially be found near construction areas. Additionally, no critical habitat necessary for these turtles is located within the Bay Area and their preferred range encompasses warmer waters. Consequently, sitings of these turtles north of Florida waters are only occasional. Regarding the Short-nose Sturgeon, all recent records are from the Hudson River except for one Florida specimen. The remaining listed species would be precluded from the project area by their habitat requirements.

CONDITIONS "WITHOUT THE PROJECT"

67. A decision not to implement the authorized improvements for the Baltimore Harbor shipping channels would have no significant direct or indirect effects on the natural systems of the Chesapeake Bay. The maximum size of vessels using the port, however, would be limited to the maximum size now accommodated. Improvements to other United States and foreign ports could reduce the competitive position of the port and this region, particularly in the area of bulk commodities. A very high percentage of the

port's commerce consists of bulk commodities which are moved most efficiently in large carriers, and the trend towards such carriers is clearly evident in the Port of Baltimore.

68. Use of large carriers at the Port of Baltimore will require the inefficiences and economic disadvantages of light-loading to insure safe navigation. As the Port is Maryland's single most important economic asset, loss of commerce would have a significant effect on the State's economic and social well-being.

CONDITONS "WITH THE PROJECT"

69. While construction of the authorized channel modification is expected to have improved economic impacts for the Port of Baltimore, the project impacts of primary concern here are confined to those generated from initial dredging, subsequent maintenance dredging, disposal of dredged materials, and changes to the hydrodynamic regime as a result of deepening the channel.

EFFECTS OF DREDGING (INITIAL AND MAINTENANCE)

BENTHOS

70. When the channels were last modified from 39 feet to 42 feet, the benthic population in the channels, both micro and macroscopic, was doubtlessly eliminated along with the interfacial sediments which supported that life. The subsequent partial filling in one of the channels involved sedimentation of materials which may not have exactly duplicated the original sediments. This is because the sediment was transported from up- and downstream and was thus a complex product of freshwater streaming and Bay shore erosion processes. As such, one might expect the repopulating channel benthos to reflect a system equilibrium somewhat different from that of the surrounding benthic communities to the degree that their sedimentary habitats differ in physical and chemical characteristics.

71. If we now superimpose periodic maintenance dredging on this ecosystem it is clear that productivity in the channel will oscillate between some value approximately zero and a value reflecting the equilibrium state mentioned before. Over a long period, the average would fall somewhere between the two extremes, meaning that, while there would be a marked environmental impact on the maintenance channels in the form of a long-term productivity loss, it would not be "catastrophic" in the sense of a permanent and complete loss. An average productivity of 25 percent of the natural value is assumed for the purposes of discussion. In order to place the significance of this in proper perspective, it is further assumed that the percentage productivity in the channels with respect to the Bay total may be derived from the ratio of their areas. The area of the Chesapeake Bay is about 2,200 square miles; that of the new channel areas is approximately 3 square miles, which represents about 0.54 percent of the total Bay area. Assuming a 75 percent loss of long-term channel productivity, the impacts in terms of the Bay as a whole would represent about a 0.1 percent loss from dredging of channel extensions. This value is actually very high because of the implicit assumptions that the productivity of the Bay bottom is uniform; actually the productivity is higher in the shoals than in the channel areas. Nevertheless, the figure of 0.1 percent is accepted as a maximum conservative loss estimate.

72. A loss of 0.1 percent represents a 42 percent increase over the estimated 0.24 percent loss incurred to date within the existing channel areas, or a total loss of Bay benthic productivity attributable to the Baltimore Harbor shipping channels of 0.34 percent.

73. One possible exception to this discussion is the York Spit and Cape Henry sections of the channels in Virginia which lie within the general area where large numbers of female blue crabs congregate to overwinter and spawn. Although the Virginia winter blue crab dredging fleet would not be immediately affected, as they are not permitted to work in the channels, a significant portion of those crabs overwintering in the channel would be lost. Two main factors, however, suggest that impacts to the general blue crab population levels throughout the Bay would not be substantial. The first is that the channels make up only a small part of the overwintering area. The second factor is that there is evidence to indicate that the size of the spawning stock does not determine the size of the population of blue crabs surviving to harvestable age. To minimize any impacts to the overwintering blue crabs, however, dredging will be restricted during 15 November to 15 March in these two channel sections, as recommended by the United States Fish and Wildlife Service.

74. During the actual dredging process sediments will be disturbed and suspended into the water column. The U. S. Army Waterways Experiment Station has investigated dredging and disposal operations for a number of years under the Dredged Material Research Program (DMRP). Results of the program have indicated that water-column turbidity generated by dredging oeprations is usually restricted to the vicinity of the operation and decreases rapidly with increasing distance from the operation due to settling and horizontal dispersion of the suspended material. The main concern with the harbor dredging is not the resultant turbidity but the release of toxic material into the water column. The DMRP research indicates long term impacts of dredged material on water quality have generally been slight. Very little net mass release of heavy metals into the water column was observed regardless of the composition of the sediments. Even during open water disposal operations it was observed that there were esentially no uptake of metals or PCB's by fish or most invertebrates.

75. Chemical testing in the Baltimore Harbor shows that portions of the sediments are contaminated, with the most polluted material in the Inner Harbor. The sediments become less contaminated as you approach the mouth of the Patapsco River. This contamination is substantially confined to the upper 10 centimeters of the sediment. The bulk of the material will be undistrubed clean materials which result from deepening the channels. Dredging operations will remove most material however some sediment will be suspended into the water column. Since the most polluted material is in the Inner Harbor, any suspended material will have a longer time to settle out before it reaches the open bay. As dredging gets closer to the mouth of the river, the settling time for suspended sediments before reaching the bay is shorter, however the material being dredged is less contaminated. In addition the material within the channels is probably less contaminated than material elsewhere in the Harbor due to the fact that the channels have been deepened and maintained in the past. Also, the low velocities in the innter harbor somewhat inhibit the transport of the sediments. The amount of contaminated material being carried to the bay as a result of dredging operations is not expected to be significant. Recent EPA testing (1981) has shown an area adjacent to the mouth of the Patapsco River to contain contaminated material and is limited in its

benthic diversity. Any suspended material resulting from dredging which make it to the bay, may settle out in this area. If so, the overall impact to the area shall not be significant.

FINFISH

76. Adult finfish should be able to avoid being impacted during the dredging operation, but species which feed on benthic invertebrates may be affected by a temporary lack of forage species in the channel. This impact should not be severe as the dredged area is relatively small in comparison to the area of the Bay.

SHELLFISH

77. There are no commercial shellfish beds in the vicinity of the dredging areas in the Virginia portion of the project. However, the channel in Maryland passes in the vicinity of chartered oyster bars. The fact that these oyster bars are located in much shallower water than the channel should help to lessen the possibility of impact. The State of Maryland has monitored maintenance dredging activities and associated open water disposal from the channels in Maryland for the period 1975-1978 and has found no significant impacts (MD DNR, 1975, 1976, 1977, 1978). Additionally, there has not been a substantial natural set of oysters from the bars in the vicinity of the channel since Hurricane Agnes in 1972. Consequently, construction dredging activities are not expected to adversely affect shellfish resources.

EFFECTS OF DISPOSAL

78. In many cases, the impacts associated with the disposal of dredged material can be greater than with the actual dredging. With the proposed method of open water disposal in the Virginia portion of the project, potential impacts which must be considered include effects on the bottom community, the generation of elevated levels of turbidity, the release of toxic materials, changes in sediment composition, and resuspension and migration of deposited materials.

79. The results of chemical testing of the sediments (both bulk analysis and elutriate testing) to be dredged from the Virginia Channel sections indicate that these materials have constituent levels characteristic of "clean" sediments (see Chemical Analysis earlier in this section). Additionally, the results of lengthy study by the United States Army Engineer Waterways Experiment Station Dredged Material Research Program (WES/DMRP) regarding characteristics of the sediment load released during open water disposal operations by a bottom dump hopper dredge, the expected dredging method for the Virginia channel sections, indicates that the material will partition into a main cloud that will descend vertically and a turbidity cloud. The main cloud will descend at a high velocity to the bottom and should experience negligible effects due to ambient water currents and variations in water density. The turbidity cloud will most probably be moved out of the general dump site area by even the smallest currents. Compared to the main cloud which descends to the bottom, the turbidity cloud will be very small in terms of total solids.

80. During 1975, maintenance dredging was performed in the Baltimore Harbor approach channels in Maryland by a bottom dumping hopper dredge with disposal in deep waters off of Kent Island. The State of Maryland carefully monitored all aspects of this operat## Island Disposal Site and Survey of Associated Environmental Impacts, " February 1976, by the Maryland Departments of Natural Resources and Transportation. The particle sizes of the dredged material ranged from approximately 0.6 to 12 microns. These particle sizes are finer than those to be dredged from the Virginia sections and so, should present a conservative indication if applied to disposal in Virginia. Results indicated that the turbidity cloud remained primarily at depths greater than 25 feet at locations within a few hundred meters of the dump site and was no longer detectable 1 hour after disposal. The main cloud "settled to the bottom as a discrete mass with little or no material reaching the surface. About 15 minutes after release most of the course material had settled out of the water leaving a plume of turbid water a few meters thick that was moved by tidal currents. After about 2 hours, the plume of turbid water had settled even more leaving only a thin layer of turbid water very near the bottom. This layer of turbid near bottom water has been ascribed to resuspension of sediment by action of tidal currents. . . A final bathymetric survey was made. . . approximately 250 days after disposal activities had ceased. . . Comparison of the two post-operational surveys shows no compelling evidence for removal of dredged materials from the disposal site."

81. The following is a discussion of expected impacts at the individual project disposal areas.

RAPPAHANNOCK SHOAL (Figure L-3)

82. During 1967, the Virginia Institute of Marine Science (VIMS) published a study of the Rappahannock Shoal Channel and disposal areas designed to determine the effects of dredging and disposal on these areas from the dredging of the then recently authorized 42-foot channel. The sampling period covered the years 1961-1964 and considered effects on benthic fauna from the processes of dredging, disposal, and sediment redistribution. Among several conclusions arrived at by the study was the finding that dredged material disposal in a deep estuarine area has a transient impact on benthic fauna. This conclusion has been affirmed by the results of the WES/DMRP Investigations.

83. As the material to be dredged from the Rappahannock Shoal Channel is essentially the same as that removed during the operations monitored by the 1967 VIMS report, it is reasonable to assume that the results should not markedly differ.

TANGIER ISLAND (Figure L-3)

84. The western shore of Tangier Island has potential as a disposal area for a limited portion of the material from the Rappahannock Shoal Channel. The material could be utilized to create wetlands under Section 150 of the Water Resources Development Act of 1976 (refer to Section L for details) to a limited degree or to provide erosion control under a program of non-Federal cost sharing. The results of a benthic survey along the western shore of Tangier Island by VIMS during 1976 indicates that both of these sites are moderately productive but without grass beds or significant concentrations of commercially harvested species. Dredged material placed in this area and protected from erosive wind and wave action would provide erosion protection to the severely eroding island, as well as productive wetland.

WOLF TRAP (Figure L-2)

85. New work and maintenance dredging of the York Spit Channel has historically been placed at the Wolf Trap disposal area with the exception of the new work dredging for the 39-foot modification, which was placed beside the channel. It is expected that impacts on the benthic community would be minimal due to similarity of sediment type between the material to be dredged and the sediments in the disposal area, and frequency of historical use - it was last used for the disposal of 520,000 cubic yards of material from the fiscal year 1977 maintenance dredging of the York Spit Channel. There are no sensitive bottoms such as grass beds or commercially harvested shellfish concentrations in close proximity to this site. The major concentration of overwintering blue crabs occur southward. Previously used areas will be utilized before beginning disposal areas in the eastward extension (refer to Section L for details). Visual examination of samples from the extension and channel sites indicate similar materials (refer to Appendix D).

DAM NECK OCEAN DISPOSAL SITE (Figure L-1)

86. This site was designated as an interim ocean disposal site for approved dredged materials by ocean dumping criteria regulations promulgated by the Environmental Protection Agency, 11 January 1977. Grain size analysis of the Cape Henry Channel sediments to be dredged indicate that they are predominantly a fine sand. They further occur in a high energy area. Additionally, testing (refer to Appendix D) has revealed characteristically clean sediments. This material definitely qualifies for disposal at this site under existing criteria. The York Spit Channel sediments will be considered for ocean disposal at some future time. They are predominantly a coarse silt. Visual examination of 10 samples from this disposal area and 30 samples from the channel indicate that the material proposed for dumping is substantially the same as the substrate at the disposal site (refer to Appendix D). Further, the dredge site is far removed from known and existing historical sources of pollution. Chemical testing (bulk and elutriate analysis; Appendix D) indicate that this material is uncontaminated.

87. The Dam Neck disposal area lies within the migratory route of many fish species, e.g., spot, croakers, weakfish, rockfish, summer flounders. As disposal would be accomplished by botto dumping hopper dredge, it is expected that disposal impacts will remain localized within the disposal area, and would generate minimum turbidity; as previously discussed in paragraph 77.

HART AND MILLER ISLANDS (see Figure L-4)

88. This diked disposal area will receive all materials from the initial dredging of the Maryland Channel Sections (refer to Section L). Material transported to the site will be placed into this containment facility by the State of Maryland to avoid impacts to the local area. Impacts associated with construction and operation of this disposal facility have been separately examined in an EIS prepared by the United States Army Corps of Engineers during 1976 in response to a permit application for the facility. This facility will be carefully monitored, under conditions of the permit, by the State of Maryland.

ADDITIONAL DISPOSAL AREAS

89. If other disposal areas or options become available over the planned life of the project (refer to Section I), impacts associated with them would be considered at that time.

FATE OF DREDGED MATERIAL DISPOSAL IN THE CHESAPEAKE BAY

VIRGINIA CHANNELS

90. The fate of dredged material placed on the bay bottom is dependent on the dredging method and disposal operation, the nature of the dredged material, and the energy regime and bottom sedimentology of the disposal areas. Owing to the complexities and interactions of the various phenomena, the prediction of the fate of the dredged material is not a precise science.

91. The dredged material will probably be placed overboard from either a barge or hopper dredge. The first phase is convective descent during which the dumped material possesses an initial downward momentum. The material settles as a cloud rather than as individual particles. This process occurs rapidly, which means that the cloud is not in contact with the upper portions of the water column very long. The second phase is collapse where the cloud flattens out with a small vertical dimension usually ranging from 3 inches to 6 inches. The final phase is long-term dispersion, which includes eddy diffusion due to random currents, mixing by wind waves, and mixing by currents.

92. Two types of particles from the channels are involved: (a) non-cohesive particles whose movement depends on particle properties such as shape, size and position with respect to other particles, and (b) cohesive particles whose resistance to initital movement or erosion depends additionally on the strength of the cohesive bond between particles. Greater currents are required to erode cohesive sediments than non-cohesive sediment, but once the cohesive bond is broken during the dredge/disposal operation these particles are susceptible to erosion.

93. The median grain size for Rappahannock Shoal Channel material ranges from 0.02 mm with an average of 0.05 mm. For the York Spit Channel, the median grain size ranges from 0.04 mm to 0.48 mm with an average of 0.17 mm.

ENERGY REGIME AT THE DISPOSAL AREAS

RAPPAHANNOCK SHOAL DISPOSAL AREA

94. Due to the depth of 80 feet at the Rappahannock Shoal Disposal Site, wave induced bottom velocities will be negligible. The primary energy source for sediment movement at this site would be tidal current. Data for the Baltimore Harbor Test on the Chesapeake Bay Model shown in Table K-3 indicates the maximum spring and minimum neap tidal bottom current velocities for the area are 0.691 and 0.114 feet per seond, respectively.

95. The bottom depth at the Wolf Trap Disposal Area is 39 feet. Wind speeds, 35 mph or greater, would result in the most significant wave induced velocities of greater than 0.5 feet per second. Based on 25 years of wind occurrences at Patuxent Naval Air Station, wind speeds greater than or equal to 35 mph from all directions would occur only about 48 hours per year, which is considered insignificant. It would, however, aid in resuspension of sediment in the disposal area. As shown in Table K-3, the maximum spring and minimum neap tidal bottom current velocities for the Wolf Trap Disposal Area are 1.833 and 0.793 feet per second, respectively.

TABLE K-3
TIDAL CURRENT VELOCITY CHARACTERISTICS - PLAN TEST CONDITION

	Depth (ft)	120,000 cfs Inflow Test				30,000 cfs Inflow Test			
		Max Velocity, Spring Tide		Max Velocity, Neap Tide		Max Velocity Spring Tide		Max Velocity Neap Tide	
		Flood	Ebb	Flood	Ebb	Flood	Ebb	Flood	Ebb
Rappahannock Shoal	80	0.434 FPS Cm/Sec	0.340	0.184	0.256	0.691 FPS Cm/Sec	0.385	0.292 FPS Cm/Sec	0.114
Wolf Trap	37	1.833 FPS 55.9 Cm/Sec	1.377	1.211	0.793 24.2 Cm/Sec	1.610	1.414	1.112	0.934

96. One of the most commonly referenced representatives of erosion and deposition criteria is a diagram developed by Hjulstrom and presented by Graf in the book entitled, Hydraulics of Sediment Transport, 1971. This diagram is shown as Figure K-5. The velocity term u is an average flow velocity.

97. Using Figure K-5 and the velocity and grain sizes for the Rappahannock Shoal Channel, the material could fall into the transportations zone. This is based on the maximum velocities shown in Table K-3.

98. Assuming that the material is transported out of the disposal area, its fate is difficult to predict. A study by the Virginia Institute of Marine Science entitled, A Study of the Effects of Dredging and Dredge Spoil Disposal on the Marine Environment, 1967, stated that sediment placed in this disposal area will tend to move northward in the bay or locally into deeper parts of the bay floor where currents are reduced. No surveys have been made of the previous disposal area to determine exactly how much of the material remained in the disposal area.

WOLF TRAP DISPOSAL AREA

99. For the Wolf Trap Disposal Area, based on the velocities in Table K-3, the material from the York Spit Channel falls in the lower portion of the erosion zone. As described previously, wave induced bottom velocities could add to the ambient bottom currents in this area on a periodic basis. Similar to the dredged material placed in the Rappahannock Shoal Disposal Area, material eroded out of the Wolf Trap would be expected to move northward in the bay or locally to deeper parts of the bay floor.

CONCLUSIONS

100. Based on the preceding analysis, it is concluded that the dredged material placed on the bottom in either the Rappahannock Shoal or Wolf Trap Disposal Areas will be subject to erosion and transportation forces that are capable of moving the material from the disposal area, most likely up the bay. Predictions as to the exact movement, quantity of material to move, and the probable locations of final deposition are difficult to make.

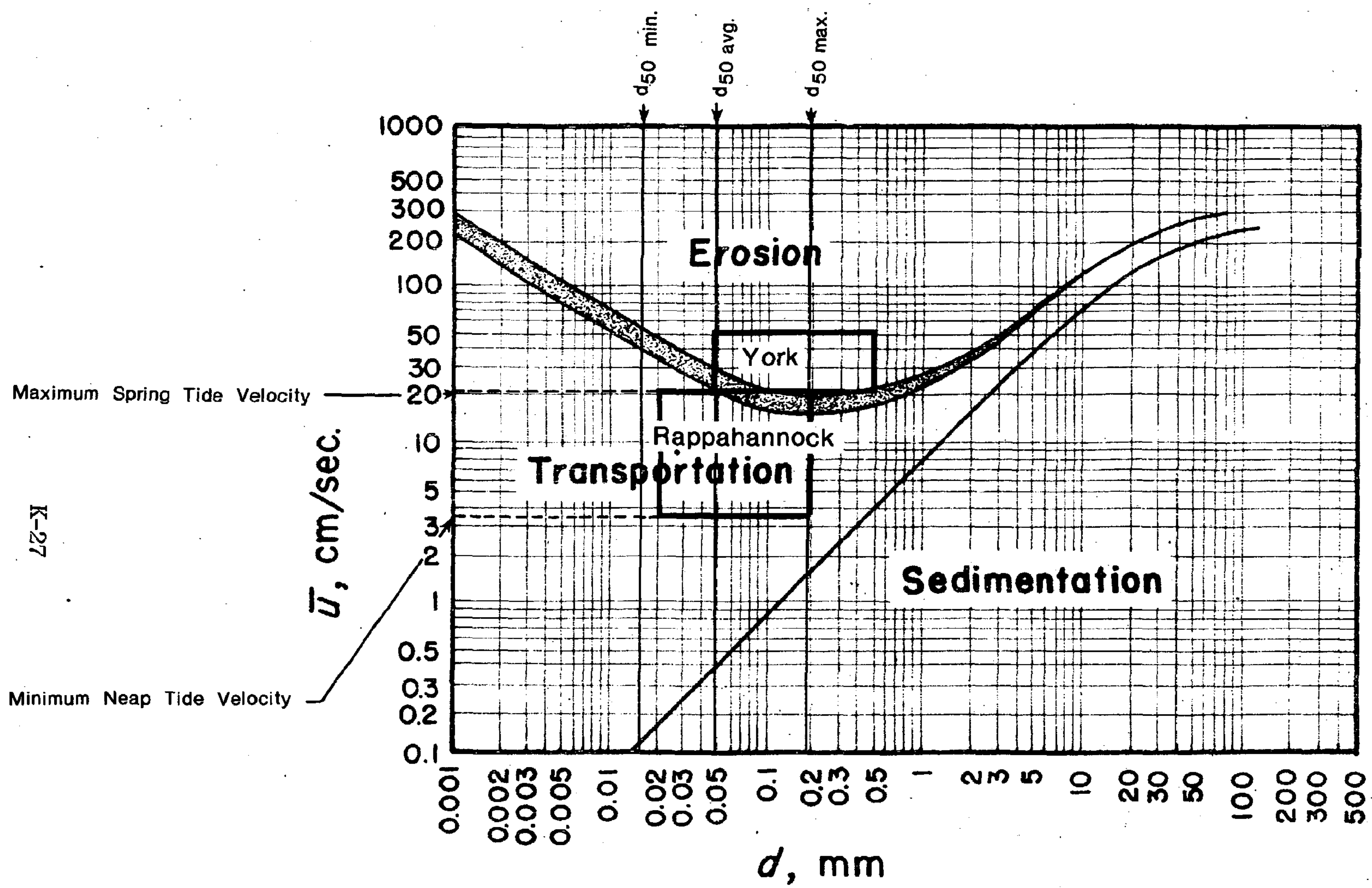


Figure K-5. Erosion-deposition criteria for Dredged Material, Rappahannock Shoal Channel

HYDRODYNAMIC EFFECTS

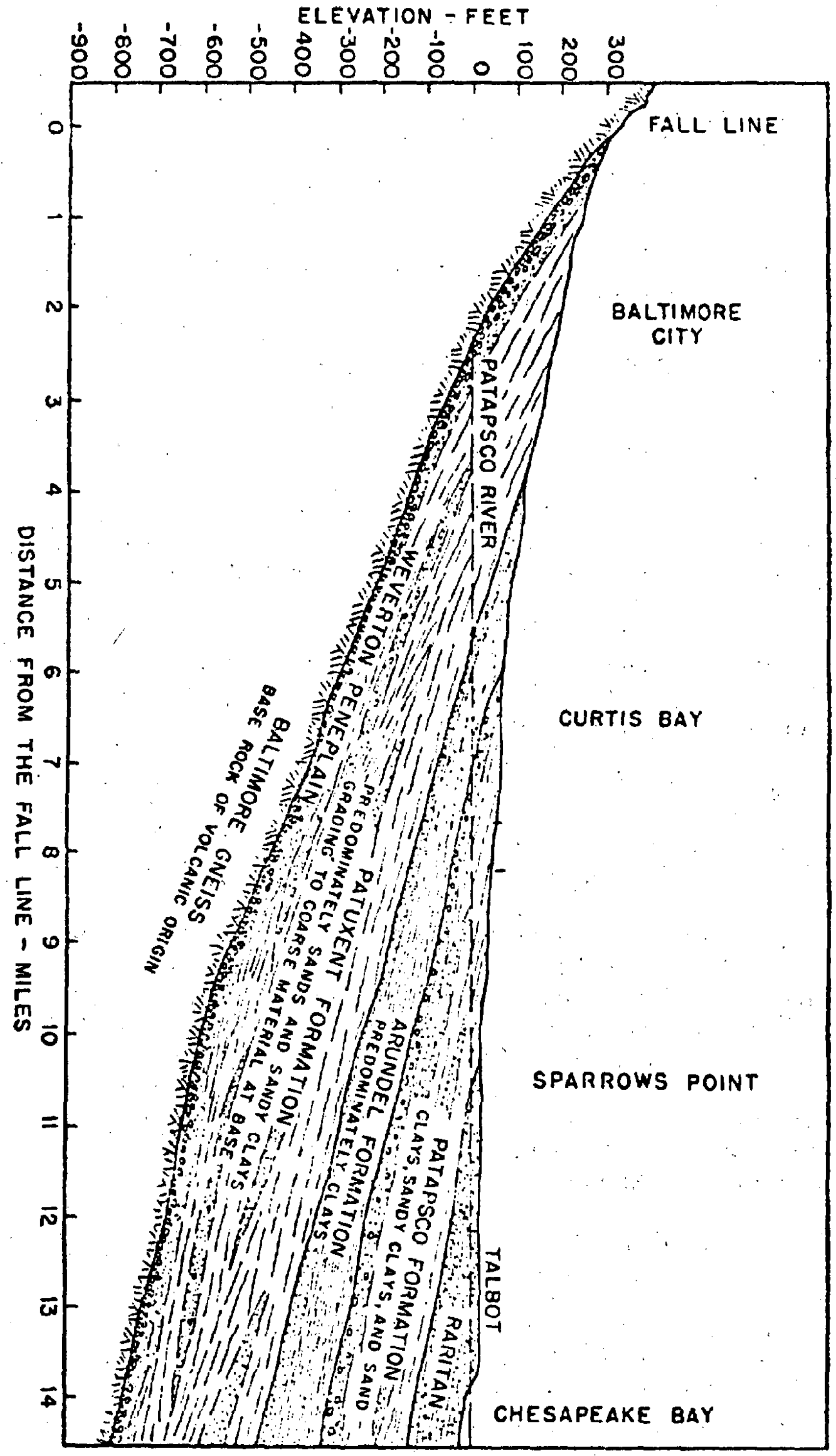
101. As part of investigations for the General Design Memorandum, tests on salinity and velocity were performed on the Chesapeake Bay Hydraulic Model in regard to the Baltimore Harbor and Channels AE&D study. Salinities were recorded for surface, mid-depth and bottom waters. Results of the model tests have indicated that some salinity differences are associated with deepening the channels.

102. Surface waters in Cheapeake Bay south of Tangier Island generally tend to become more saline, while surface waters up bay from Tangier generally become somewhat less saline. Mid-depth and bottom waters generally became more saline in the bay during the test. Test results at the mouth of the James and York Rivers indicate a reduced salinity intrusion with fresher deep water.

103. The increase in salinity at the bottom depths was greatest in the deeper channels rather than shallower adjacent areas. This was expected to occur since saline water is more dense than freshwater and the deeper an area is the more saline it usually becomes. The majority of increases based on seasonal averages and reflected by the model tests were in the range of 0 to 2 ppt difference. In general, salinity differences alternate with distance from the deepened channel and at shallow water stations. Since organisms within the bay usually live within a range of salinities and since salinity ditribution varies from year to year, the small slainity increases should not adversely affect the biota. If salinity is critical to certain organisms survival their distribution may be shifted to adjust for any salinity changes which may occur.

104. There were two monitoring stations at the mouth of the York and James Rivers. No monitoring stations were upstream of the mouth or any tributary. At each of the two rivers one of the stations showed no significant changes in salinity as a result of deepening the channels while the other station showed a small decrease in salinity. The decreases in salinity were observed in less than 10 percent of all samples while over 88 percent of the samples were within the designated error band. If the mouth of the James and York Rivers became somewhat fresher and this is reflected along the entire Tributary, the effect should not be too significant. The natural seasonal variations in these two tributaries is greater than the model test differences. The organisms along the edges of certain isohalines may be forced to move to compensate for the change in salinity, however this should not be significant. Also, salinity changes may be beneficial whether or not the salinity increases or decreases. For example more saline waters may expand the area which may be suitable for oyster spat settling while fresher waters may limit the oyster drill, MSX, and other pathogens.

105. The greatest salinity difference indicated by the model tests were in the Patapsco River where a majority of the results were greater than 5 ppt saltier. Stations in nondeepened side channels within the Patapsco River and the main bay connecting channel leading to the C&D Canal indicate a somewhat reduced salinity response compared with adjacent main channel stations. Differences at shallow-water stations within the Patapsco River indicate a much reduced salinity sensitivity to channel deepening. Since the salinity differences seem to be greatest in the channel of the Patapsco River, organisms within the channel will be affected the most. The benthic community within the river may be altered; however, due to contaminated sediments this community is extremely limited. Motile species will avoid the channel if salinities surpass their tolerance level.



SIMPLIFIED CROSS-SECTION OF THE COASTAL PLAINS
FORMATIONS IN THE BALTIMORE AREA

FIGURE K-6

106. Dr. William Boycourt of Johns Hopkins University modified and applied a mathematical model developed by Dr. Dong-Ping Wang to the deepening of the Baltimore Harbor and Channels and its effect on Baltimore Harbor. This model takes into account the effects of wind in the harbor while the hydraulic model does not. Dr. Boycourt's results concur with the results of the Chesapeake Bay model in that both show an increase in salinity of the harbor due to channel deepening. The results of the math model show an increase of salinity of about 2-3 ppt compared to the hydraulic model results of greater than 5 ppt. This difference could be due to the fact that different boundary conditions were used for each model.

107. In addition to salinity, the Cheapeake Bay Model test also monitored velocity. In general, only subtle differences were indicated for test comparisons of amplitude, offset, maximum flood, and maximum ebb values with existing conditions. Over 90 percent of these comparisons for each of the parameters were within the error band for these measurements.

108. Although no major velocity variations were indicated as a result of channel deepening, slight trends in velocity characteristics may indicate subtle variations in the hydrodynamics of the system. The overall reduced velocity (amplitude) at each depth during the plant tests is consistent with increased cross-sectional area associated with channel deepening. The slight trend of increased flood dominance (higher flood and lower ebb velocities) at the lower bay stations indicates the possibility of additional salt intrusion into the main estuary along the deepened channel. A return flow of estuarine water may exist in the shallower nonsampled areas.

109. In general, the examination of the current velocity information obtained during the Baltimore Harbor Study or the hydraulic model of Chesapeake Bay has shown that current velocity changes in the model resulting from the enlargement of the navigation channels are relatively small. Since this was expected to occur, no additional investigations are anticipated in this area.

GROUNDWATER EFFECTS

110. Salt water intrusion is considered to be the only possible effect of the project on groundwater. For purposes of assessing effects on groundwater, the project can be divided into two general areas.

VIRGINIA CHANNELS

111. In the Virginia portions of the channel dredging, no adverse impact is likely. In this area the bottom and subbottom sediments are generally unconfined flat-lying sands, silts, and clays. The area of exposure of aquifers to salt water intrusion is very large in the natural condition, and the additional exposure is insignificant. In addition, there are no known areas of large-scale withdrawal from the aquifers anywhere near the project.

BALTIMORE AREA

112. In the Baltimore area the dredging project crosses the strike of the southeast dipping sediments (see Figure K-6). Historically, heavy industrial pumping from wells near the Chesapeake Bay and Patapsco River has resulted in drawdown of groundwater levels and subsequent intrusion of salt water into aquifer outcrop exposed beneath the Bay River. Some aquifers in the region may have become permanently contaminated;

both from direct pumping, and also the collapse of old abandoned well casings causing interconnections between contaminated and previously unaffected aquifers. In either case the degree and area of intrusion are directly related to amount and location of the pumping withdrawal within the aquifer.

113. In the Baltimore metropolitan area the effect of the project could be to cause additional exposure of the outcrop area of the aquifers beneath salt or brackish water, leading to a possible increased rate of salt water intrusion. Since salt water intrusion has been noted in the area since at least 1895, the project would not create a new potential source of pollution. Whether or not it would be a source of additional intrusion at all would be dependent on the present use of the aquifers. It is believed the effect would be minimal and may be reduced with time by normal bottom sedimentation forming a relatively impervious blanket over the aquifer outcrop.

CULTURAL RESOURCES

114. The Corps of Engineers is required by the National Environmental Policy Act of 1969 (Public Law 91-190), Section 106 of the National Historic Preservation Act (Public Law 89-665), and Executive Order 11593 (Protection and Enhancement of the Cultural Environment) to identify all sites and properties within a project's potential environmental impact that are eligible for listing in the National Register of Historic Places. To comply with these laws, a cultural resources reconnaissance of the Baltimore Harbor and Channels, channel extensions, and overboard disposal areas was prepared by the Karell Institute, Arlington, Virginia, underwater cultural specialist, in the summer of 1978.

115. The cultural resources reconnaissance consisted of a documentary literature search and evaluation of the (Mueser et. al 1978) side scan sonar geophysical survey to locate and identify shipwrecks and other submerged anomalies in the Baltimore Harbor and Channels. Nine potential shipwreck anomalies and numerous smaller targets were located in the navigation channels. Mr. Koski-Karell recommended that the Baltimore District undertake an Intensive Survey to obtain a closer look at the above suspected cultural resource anomalies along with undertaking a proton magnetometer survey of the Baltimore Harbor and Channels.

116. Environmental studies completed concurrently with the cultural reconnaissance study resulted in the likely deletion of some project elements considered by the cultural investigation. For this reason, the Baltimore District programmed a modified sampling strategy for the next stage (Intensive Survey) cultural resources investigations. J. Joseph Murphy and Associates, Latham, New York, is currently completing this study. Of note, a hands-on examination of Tangier Island's western shoreline and offshore zones found that the offshore beach has been severely scoured by the Bay's currents and wave actions which displaced any cultural resource that had been present. On the shore's interface zone, however, a large prehistoric shell heap that had been sectioned by the construction of the navigation inlet on the western shore cut in 1960 and three smaller prehistoric shell heaps on the shore interface were located. Additionally, a hands-on examination of two anomalies in the York Spit Channel found no significant cultural resources.

117. The results of the Intensive Survey indicate that there are no culturally significant submerged shipwrecks or historic sites in the construction areas. Prehistoric cultural resources that may exist in project areas other than nearshore zones were not addressed as they would be virtually impossible to locate. This is because the State of the Art methodology is by core sampling. This method is both highly inefficient and has a very low probability of recovering prehistoric cultural materials in a large body of water. The prehistoric shell heaps identified on the western shore of Tangier Island could be impacted by a beach nourishment project. These impacts will be considered by project plans. The project described in paragraphs L-10 through L-16 and illustrated in Figure L-3, however, is not located near this resource and would have no impact upon it. Pending receipt of the Intensive Survey report, no further possible cultural impacts have been identified.

THREATENED AND ENDANGERED SPECIES

118. Dredging and associated disposal from the construction and maintenance of the authorized project is not expected to affect the status of any threatened or endangered species as many would not be expected to be found in the project construction areas, the low probability of the remaining species occurring within the Chesapeake Bay area, and a lack of critical habitat necessary to these latter species occurring within the project area. For further information refer to paragraph 65.

SECTION L

PROJECT PLAN

GENERAL

1. The authorized plan of improvement provides for meeting the needs of existing and future commerce. The following paragraphs describe the details of the plan.

RECOMMENDED PLAN

2. Following a re-analysis of the criteria used to determine the depths and widths of the channels in the June 1969 review report and an analysis of constructing the inbound portion of the channels first, it has been determined that construction of the project as authorized in the Project Document is the most feasible plan. The authorized plan of improvement for Baltimore Harbor and Channels, as shown on Figures L-1, L-2, L-3, and L-4 provides for:

a. Deepening the Cape Henry Channel from 42 feet to 50 feet and extension to 50-foot depth curves.

b. Deepening the York Spit Channel from 42 feet to 50 feet and extension to 50-foot depth curves.

c. Deepening the Rappahannock Shoal Channel from 42 feet to 50 feet, widening from 800 feet to 1,000 feet, and extension to 50-foot depth curves.

d. Deepening the Main Ship Channel from 42 feet to 50 feet and extension to 50-foot depth curves.

e. Deepening the Curtis Bay Channel from 42 feet to 50 feet.

f. Deepening the Northwest Branch - East Channel to 49 feet deep for a width of 600 feet, with a turning basin at the head of the channel from that depth existing at the time of construction.

g. Deepening the Northwest Branch - West Channel to 40 feet deep for a width of 600 feet, with a turning basin at the head of the channel from that depth existing at the time of construction.

3. Based on past dredging experience in the project channels, the initial dredging will include 2 feet of allowable pay overdepth to account for the normal inaccuracies of the dredging process. In addition, it is estimated that 1 foot of non-pay overdepth dredging may occur and must be taken into account as it lengthens the dredging and rehandling operation and requires additional disposal area capacity.

FIGURE L-1

AUTHORIZED PLAN AND DISPOSAL SITES - DAM NECK AND NORFOLK

AUTHORIZED PLAN AND DISPOSAL SITES - DAM NECK AND NORFOLK

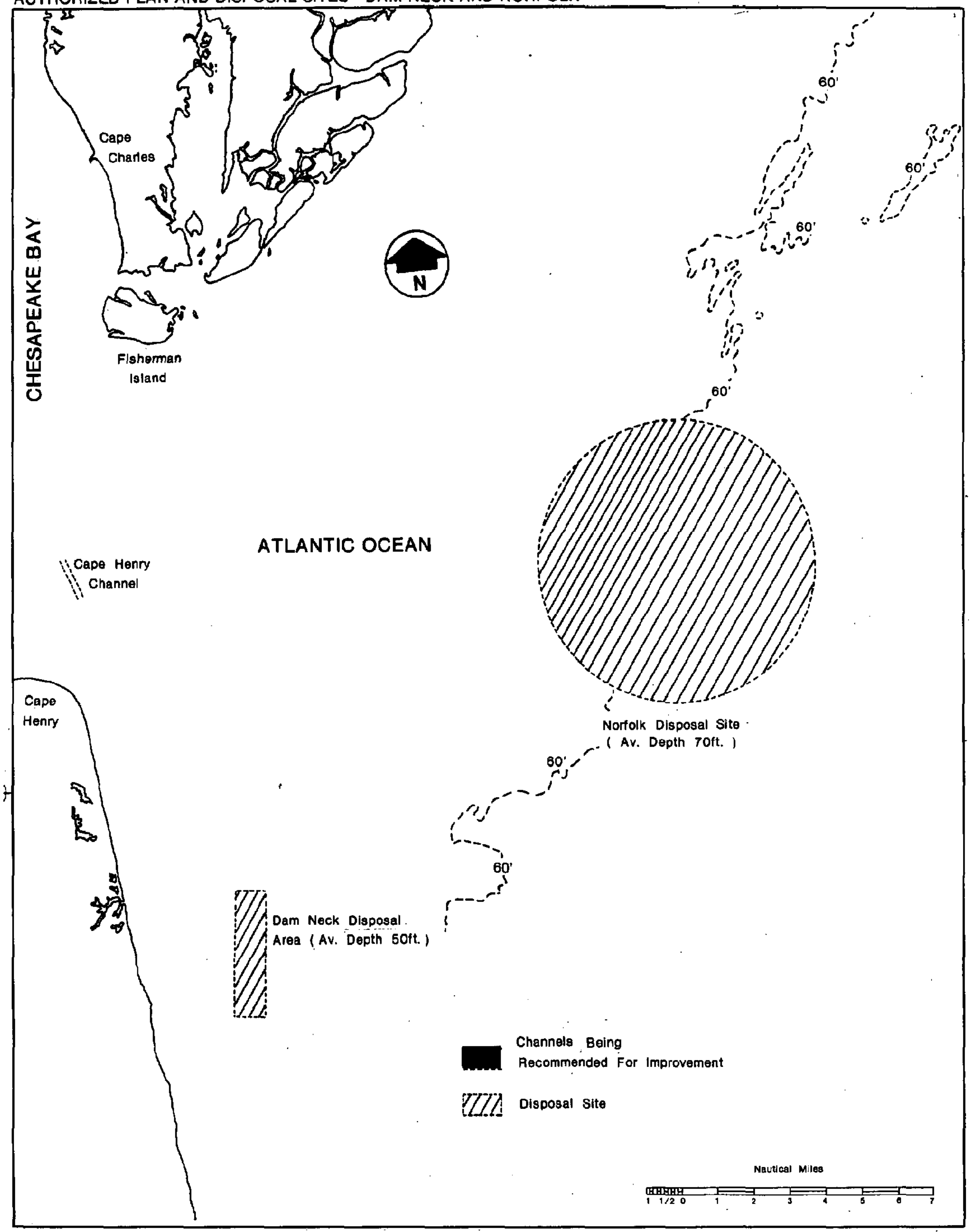


Figure L-1

FIGURE L-2

AUTHORIZED PLAN AND DISPOSAL SITE - WOLF TRAP

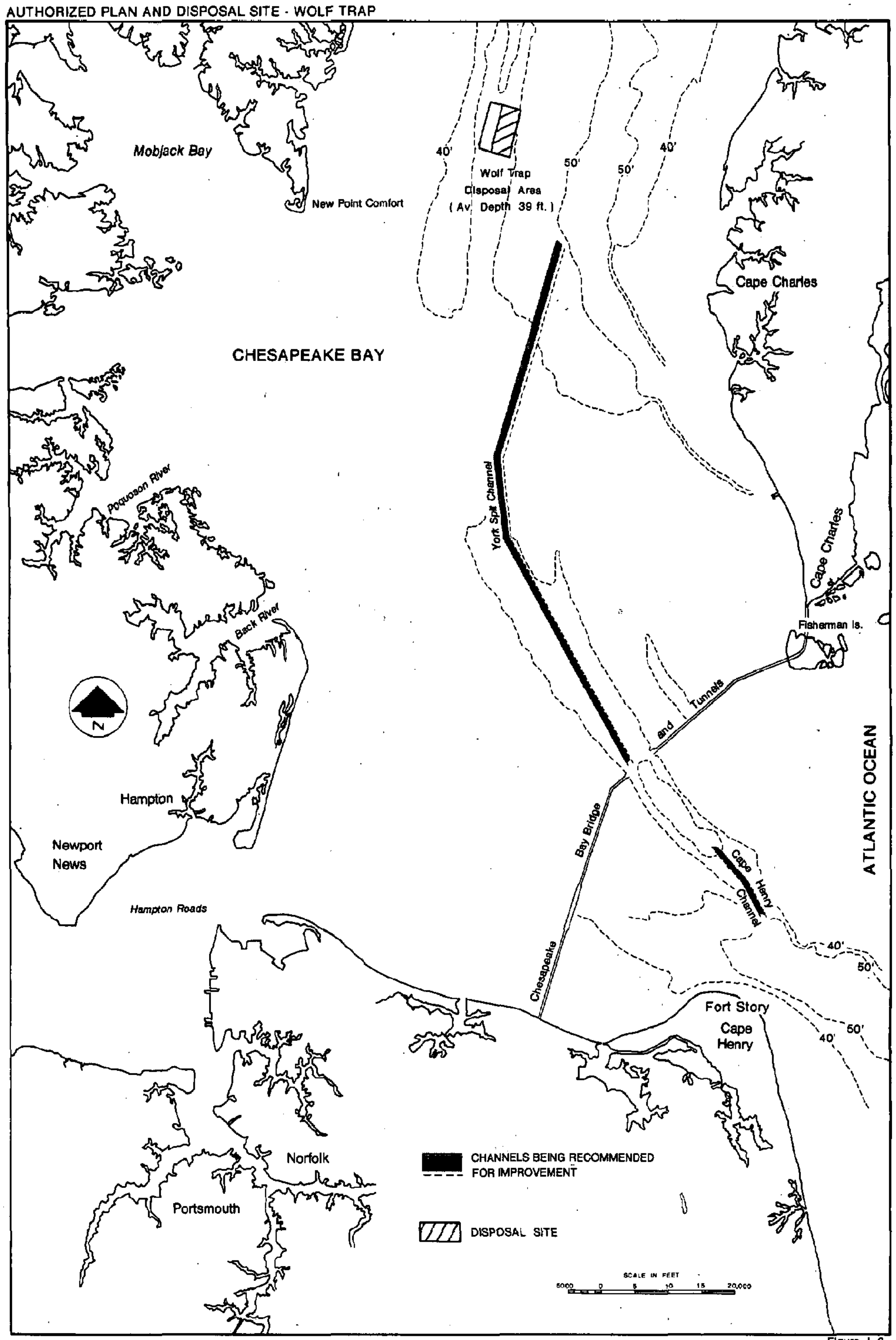


FIGURE L-3

AUTHORIZED PLAN AND DISPOSAL SITE - RAPPAHANNOCK SHOAL

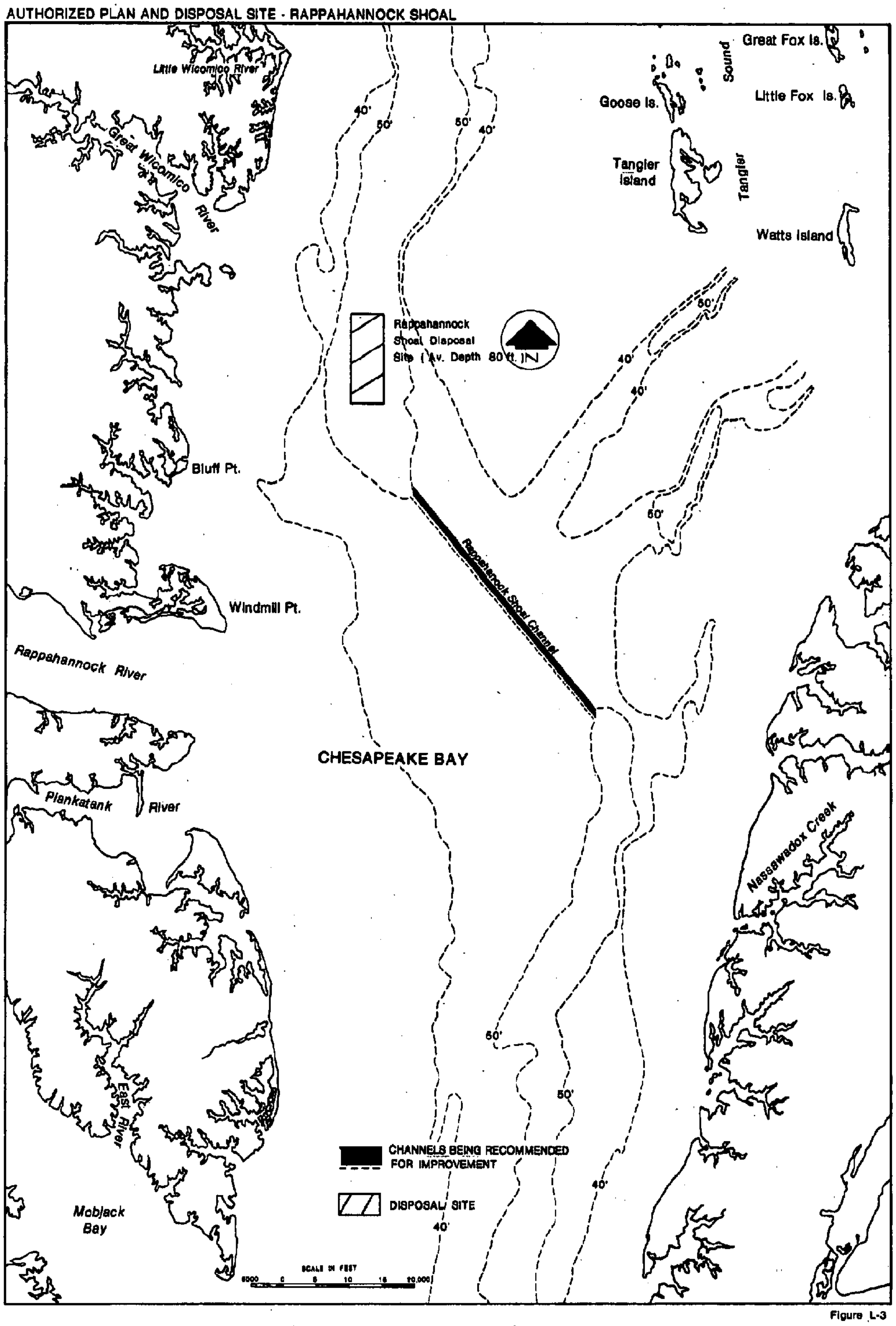


FIGURE L-4
DISPOSAL SITE MARYLAND CHANNELS

AUTHORIZED PLAN AND DISPOSAL SITE - HART-MILLER ISLAND

AUTHORIZED PLAN AND DISPOSAL SITE - HART-MILLER ISLAND

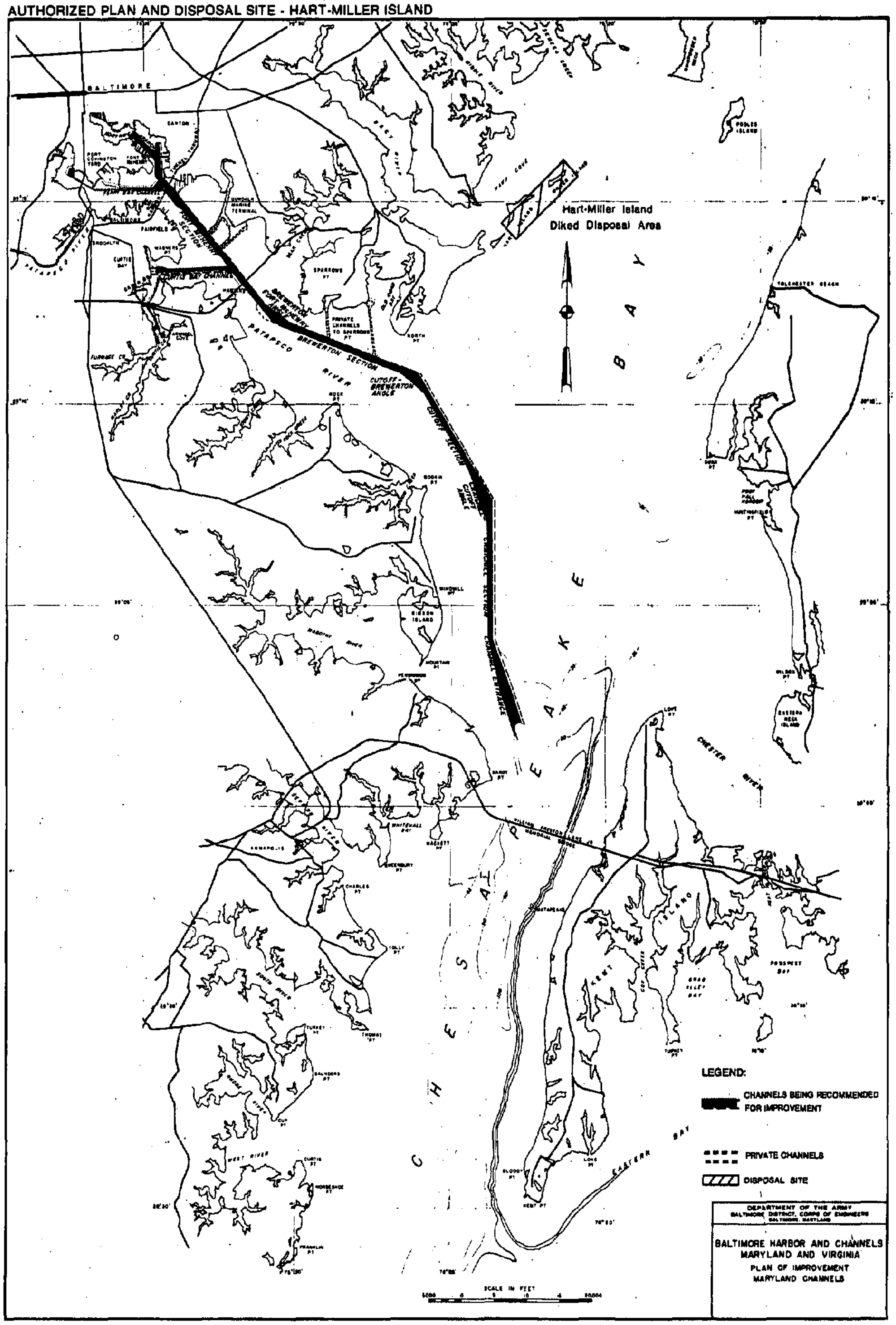


Figure L-4

4. Material from the Virginia Channels would likely be removed by hopper dredges and placed at designated sites. Material from the Maryland Channels would likely be removed by bucket and scow and deposited in the Hart and Miller Islands contained sites. Hart and Miller Islands would be equipped with rehandling facilities to unload the material upon arrival. This would consist of a pump facility and clamshell dredge. Material that could not be pumped would be removed by clamshell.

5. Current estimates of first and annual costs of the project plan, along with a comparison of previous estimates, are presented in Section O, "Cost Estimate."

DREDGED MATERIAL DISPOSAL

INITIAL CONSTRUCTION

VIRGINIA CHANNELS

6. About 2.5 million cubic yards (mcy) of dredged material from the Cape Henry Channel will be placed overboard in the Atlantic Ocean in the Norfolk Disposal Site, about eighteen miles northeast of Cape Henry (see Figure L-1) or at the existing ocean site (Dam Neck). The latter disposal site is near full capacity and due to be closed to disposal operations. Use of the Norfolk Disposal Site is subject to approval by the Environmental Protection Agency (EPA) under the authority of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended. At the request of the Commonwealth of Virginia, the potential for placing suitable dredged material from the Cape Henry Channel onshore at Fort Story, Virginia, for potential future beneficial uses was evaluated. The procedure for accomplishing the onshore disposal was based on a similar operation conducted by the Norfolk District, Corps of Engineers, in November 1975 during which about 450,000 cy of sand from the Thimble Shoal Channel was placed onshore at Fort Story, Virginia, to be eventually used as beachfill at Virginia Beach, Virginia. Details of this operation are contained in the report entitled, "Recovery and Stockpiling of Sand from the Offshore Zone for Beach Nourishment Purposes," June 1976, by the Norfolk District, Corps of Engineers. Basically, the hopper dredge "Goethals" dredged the material from the Thimble Shoal Channel, transported it to a mooring barge about 1,000 feet offshore of Fort Story, Virginia, and then pumped it onshore to a designated stockpile area at Fort Story.

7. One basic difference between the previous operation in 1975 and the operation currently being evaluated in conjunction with the Baltimore Harbor dredging project is the nature of the dredged material. Median grain sizes from the Thimble Shoal Channel ranged from 0.25 mm to 0.50 mm and compared favorably with the median grain size of the native beach material at Virginia Beach which ranges from 0.27 mm to 0.40 mm. Based on January 1978 samples, the medium grain size of the material in the Cape Henry Channel is estimated to range from 0.15 mm to 0.30 mm and as a result would probably not be as suitable for beachfill as the coarser Thimble Shoal Channel material. However, the Norfolk District has indicated that if the material is to be used for Virginia Beach, material from Cape Henry would be better than material currently being used for beach nourishment.

8. Table L-1 compares the unit costs and first costs of dredging material from the Cape Henry Channel and placing it onshore at Fort Story with the unit cost and first costs of placing the material overboard in the Norfolk Disposal Area in the Atlantic Ocean. A reasonable capacity of the Fort Story disposal site is estimated to be from 500,000 to 750,000 c.y. From Table L-1, it is evident that placement at Fort Story is more costly

TABLE L-1

Cost Comparisons of Cape Henry Channel
Dredged Material Disposal Alternatives
(February 1981 Price Level)

	Overboard Disposal in Norfolk Site		Onshore Disposal at Fort Story, Virginia	
500,000 cy	$1,350,000	@ $2.70/cy	$1,625,000	@ $3.25/cy
Contingencies (12%)	162,000		195,000	
Engineering and Design (3%)	45,360		54,600	
Supervision and Administration (5.5%)	83,160		100,100	
Total First Cost	$1,640,520		$1,974,700	

per cubic yard placed. This is due to the initial cost of the rehandling equipment required. If this operation is conducted, the costs over and above the overboard disposal in the Norfolk site would have to be provided by non-Federal interests. Any material not placed at Fort Story would be placed at the ocean site.

9. Two sites in the Chesapeake Bay were investigated for placement of the 19.5 mcy of material to be dredged from the York Spit Channel. These were a previously used open water site (Wolf Trap) and a site in a deep trough (Cape Charles). Environmental concerns resulted in the elimination of the Cape Charles site. Accordingly, cost estimates reflect that the 19.5 mcy of material from the York Spit Channel will be placed overboard in the Wolf Trap site (see Figure L-2).

10. Material dredged from the Rappahannock Shoal Channel will be placed overboard in the Rappahannock overboard site, shown on Figure L-3. The quantity of disposal material will be 8.6 mcy. In addition, a shoreline site was also considered for creation of wetland under Section 150 of the Water Resources Act of 1976, with dredged material from the northern section of the Rappahannock Shoal Channel. Wetland creation under Section 150 is limited to a cost increase of $400,000 over the cost of the proposed disposal method. The site evaluated was Tangier Island, Virginia, and is shown on Figure L-2. Consultations with Waterways Experiment Station (WES) staff engaged in habitat development projects associated with the Dredged Material Research Program indicate that wetland creation would be feasible at this site.

11. In a report to the Baltimore District, WES indicated that, based on a preliminary evaluation, the possibility of a project combining shoreline stablization, dredged material disposal, and marsh development on the west side of Tangier Island would be technically feasible. As indicated in their report, the major problem in conducting the project would be expense. First, the water energy conditions at the disposal site require that a substantial containment structure be constructed. Second, the approximate 7 mile to 10 mile distance between the dredging and potential disposal sites would result in high unit costs per cubic yard of disposal material.

12. In view of these concerns, a preliminary wetland creation project design was developed that would adhere to the Section 150 cost limitation of $400,000 over the cost of the proposed disposal operation, which in this case is overboard disposal in the Rappahannock Shoal site shown on Figure L-3. Based on October 1978 price levels, it was estimated that placing material from the Rappahannock Shoal Channel in the Rappahannock Shoal overboard disposal site would cost $0.89 per cubic yard. In comparison, dredging material from the Rappahannock Shoal Channel and placing it behind previously constructed dikes on the west shore of Tangier Island would cost about $9.90 per cubic yard based on a total quantity of 15,000 cubic yards. This cost would be expected to decline through economy of scale with larger quantities. Under Section 150, the difference in unit costs between the two disposal methods plus the cost of any required retaining structures cannot exceed the $400,000 cost limitation. Therefore, any wetland creation beyond this $400,000 cost limitation, other than the costs associated with placement at the Rappahannock Shoal site, would have to be funded by non-Federal interests.

13. As indicated in WES's report, a substantial containment structure would be required to withstand the water energies existing along the Tangier Island shoreline. This design is based on information contained in WES's report and information contained in Technical Report D-78-31, "Design Concepts For In-water Containment Structures For Marsh Habitat Development," 1978, prepared by the U.S. Army Coastal Engineering Research Center. In addition, outflow structures would have to be incorporated in the dike design to allow

for discharge volumes expected at maximum tides, storm tides, and heavy rainfall run-off. Prior to final design, a detailed analysis of the nearshore wave climate and currents, tidal fluctuations (both normal and storm-induced), foundation conditions and impacts of the structure's presence on the adjacent shoreline system would be required.

14. Based on October 1978 price levels, the unit cost of this structure was estimated to be $400.00 per linear foot. Reflected in this cost is the assumption that existing foundation conditions are sufficient to support the structure without significant settlement and to provide adequate slope stability.

15. In order to adhere to the $400,000 cost limitation of the Section 150 criteria, the length of the containment area dike would be limited to 500 linear feet. The containment area provided would be 400 feet long and 50 feet wide and would accommodate about 6,700 cubic yards of dredged material at an elevation of about +1.0 foot mean low water (mlw) and would result in a wetland creation project of about 0.46 acres. From observations made during a site visit to Tangier Island in August 1978, it appeared that smooth cordgrass, saltmeadow cordgrass, and saltgrass are the predominant marsh species on the island. Due to the better erosion resistance of the smooth cordgrass, it was recommended that it be used for the marsh establishment in this project. The preliminary location of the project would abut the northern end of the revetment constructed recently by the Commonwealth of Virginia, Division of Aeronautics, State Corporation Commission. The project would consist of a dike constructed of coarse sand about 10 feet high with 1 vertical on 3 horizontal side slopes, 6-foot crest width, and armor stone placed along the seaward side of the structure to preclude erosion. About 400 feet of shoreline would be protected by the project. Although this is a very small segment of the 7,000-foot shoreline south of Tangier Channel that is eroding, protection of this 400-foot segment would protect the southern end of the airport runway. Table L-2 indicates the first costs of the wetland creation project.

16. Based on preliminary engineering and economic data, it appears that a 0.46 acre wetland creation project that would provide erosion control for about 400 feet of the Tangier Island shoreline is feasible under the $400,000 cost limitation of the Section 150 authority. Updating the 1978 analysis to current price levels would, of course, tend to reduce the size of the wetland area that could be created within the $400,000 limitation. However, as indicated earlier, detailed studies are required prior to final design of the project. In addition, construction of the project under the Section 150 authority must be approved by the Office of the Chief of Engineers prior to final design and implementation. Based on the analysis conducted, it was concluded that construction of significant protection of Tangier Island was exceedingly expensive. Additionally, it would not provide a site for a significant portion of dredged material. Therefore, material from the Rappahannock Channel will be placed at the overboard site.

MARYLAND CHANNELS

17. Dredged material from the Main Ship Channel and Branch Channels will be placed in the Hart-Miller Island Diked Disposal area to be constructed by the State of Maryland. This area, shown on Figure L-4, will be an 1,100 acre facility and will contain an estimated 52 mcy of material when filled to its capacity at elevation 18 feet above mean low water (mlw). The dimensions of the diked area are approximately 12,900 feet by 4,700 feet. Typical side slopes are 3:1 (3 horizontal to 1 vertical) on the exposed outside face of the dike and 5:1 on the inside face. Also, material dredged from the private access channels will likely be placed in the Hart-Miller Island area.

TABLE L-2

First Costs
Section 150 Wetland Creation Project
(October 1978 Price Level)

FIRST COSTS	
Containment Structure Sand Dike w/Rock Revetment Protection	
500 LF @ $400/LF	$200,000
Outflow Structures	20,000
Contingencies (20%)	44,000
Engineering and Design, Supervision and Administration	31,700
SUB-TOTAL	$295,700
Dredged Material Disposal	
8,000 cy @ $9.00/cy (Assumes 20% loss of material to obtain 6,666 cy design fill)	$ 72,000
Marsh Establishment	2,000
Contingencies (20%)	14,800
Engineering and Design, Supervision and Administration (12%)	10,700
SUB-TOTAL	$ 99,500
TOTAL PROJECT COSTS	$395,000

50-YEAR MAINTENANCE

VIRGINIA CHANNELS

18. Based on a continued lack of maintenance requirements for the Rappahannock Channel as the channel depth has been increased, no significant increase in maintenance dredging is anticipated with the deepening to 50 feet. During the period 1968-1978, 2.7 mcy of material were dredged from the York Spit Channel. This amounts to an average of about 245,500 cy per year. During the same period, 1.1 mcy of material were dredged from the Cape Henry Channel. This amounts to an average 100,000 cy per year. Due to the lengthening of each of these channels with the deepening to 50 feet, it is anticipated that maintenance dredging will increase. For the purpose of this report, it is estimated that the maintenance dredging requirement for each of the two channels will increase by the percentage of length increase for each channel. For the York Spit channel, the channel length will increase from 10.4 miles to 18.2 miles or about 75 percent. The Cape Henry Channel length will increase from 1.0 mile to 2.7 miles or about 170 percent. Using these percentage increases, it is estimated that the additional maintenance dredging required due to the deepening to 50 feet will amount to 184,000 cy per year and 170,000 cy per year for the York Spit Channel and the Cape Henry Channel, respectively. It is anticipated at this time that all future maintenance dredging material from the Virginia Channels will be placed in the same disposal areas as the new work dredging discussed earlier.

MARYLAND CHANNELS

19. No significant increases in maintenance dredging requirements are anticipated with the deepening of the Maryland Channels to 50 feet as the channels will be extended by an insignificant amount. During the period 1968-1978, 6.9 mcy of material were dredged from the channels. This amounts to an average of 625,700 cy per year. Future maintenance dredging material from the Maryland channels will be placed in the Hart-Miller Island Diked Disposal area until it reaches capacity. Based on the anticipated maintenance dredging requirements, the new work quantity to be placed in the area and the assumption that the Hart-Miller Island site will be used primarily for disposal of material from Baltimore Harbor Channels, the Hart-Miller area will reach capacity within 10 years after the initial new work disposal operation is completed. Maintenance dredging from that time on will have to be placed in other disposal areas to be provided by the State of Maryland. Table L-3 from the report entitled, "Management Alternatives for Dredging and Disposal Activities in Maryland Waters," 1977, by the Maryland Department of Natural Resources indicates the existing and proposed disposal sites under consideration. These areas are shown on Figures L-5 and L-6. It is estimated that the total maintenance dredging requirement for the Maryland Channels during the project life will be about 31.3 mcy (50 years x 625,700 cy/yr). If it is assumed, as stated earlier, that the Hart-Miller site will be filled to capacity with the first 10 years of maintenance dredging from the channels, amounting to about 6 mcy, the alternative disposal sites will have to accommodate about 25.3 mcy of material for the remainder of the 50-year project life.

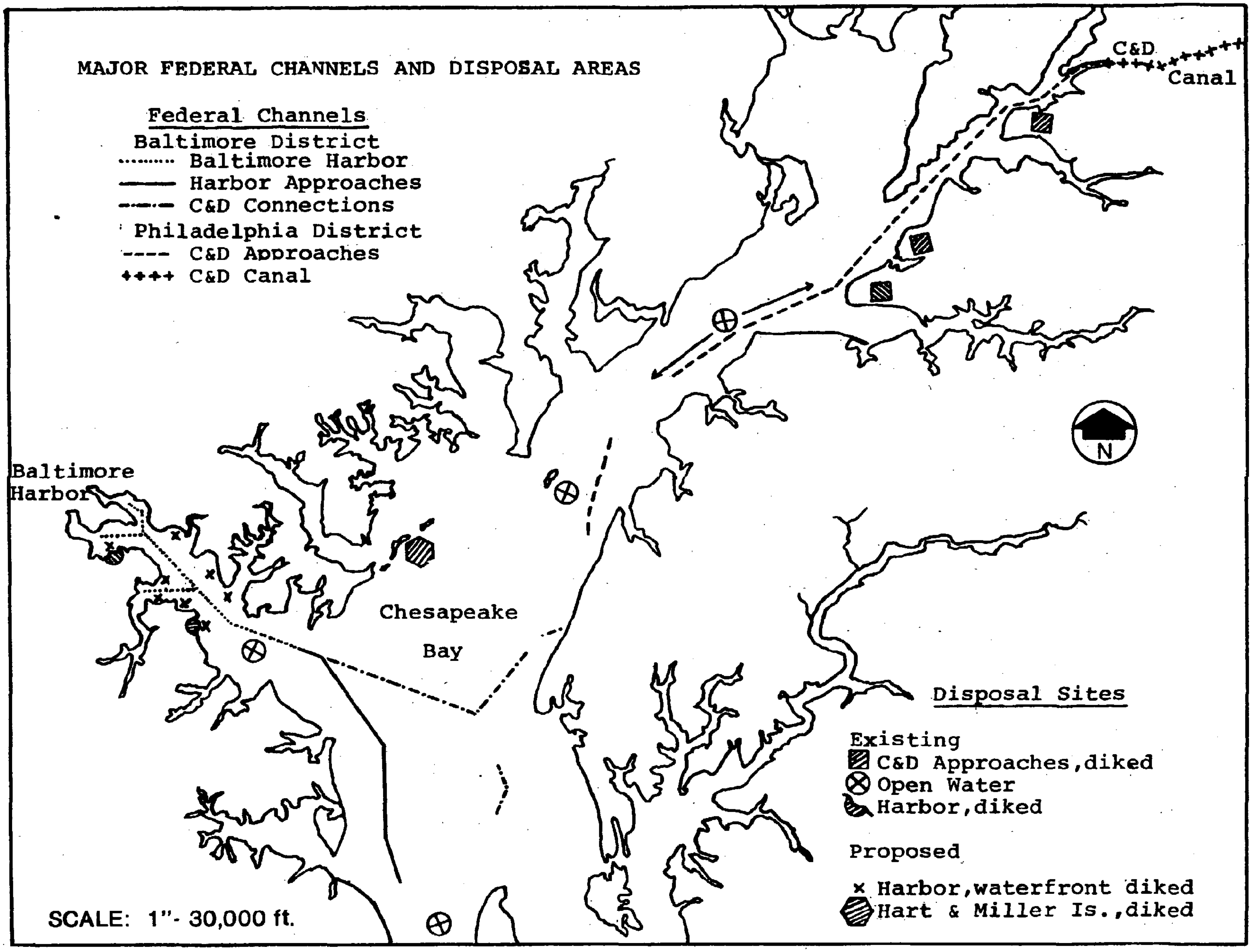
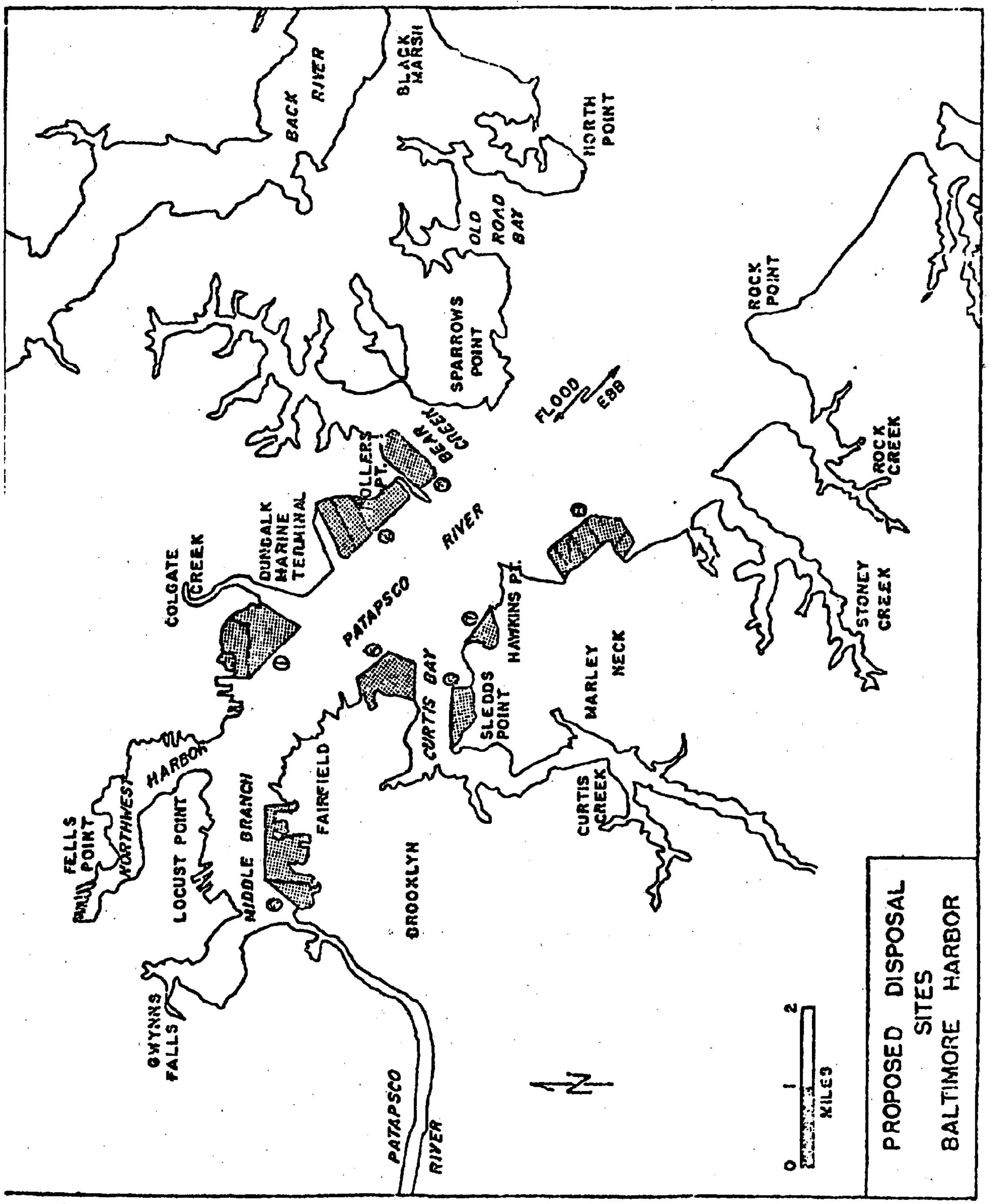

MAJOR FEDERAL CHANNELS AND DISPOSAL AREAS
Federal Channels
Baltimore District
Baltimore Harbor
Harbor Approaches
C&D Connections
Philadelphia District
C&D Approaches
C&D Canal
C&D
Canal
Baltimore
Harbor
Chesapeake
Bay
N
Disposal Sites
Existing
C&D Approaches,diked
Open Water
Harbor,diked
Proposed
Harbor,waterfront diked
Hart & Miller Is.,diked
SCALE: 1"- 30,000 ft.

Figure L-5



PROPOSED DISPOSAL
SITES
BALTIMORE HARBOR
BACK RIVER
BLACK MARSH
NORTH POINT
OLD ROAD BAY
SPARROWS POINT
ROCK POINT
FLOOD
EBB
BEAR CREEK
OLLERS PT.
ROCK CREEK
DUNDALK MARINE TERMINAL
COLGATE CREEK
PATAPSCO RIVER
HAWKINS PT.
STONEY CREEK
MARLEY NECK
SLEDDS POINT
CURTIS BAY
FAIRFIELD
NORTHWEST HARBOR
FELLS POINT
LOCUST POINT
MIDDLE BRANCH
BROOKLYN
CURTIS CREEK
GWYNNS FALLS
PATAPSCO RIVER
0
1
2
MILES

Figure L-6

TABLE L-3
MARYLAND DISPOSAL SITE INVENTORY

1. EXISTING SITES	Area and/or Max. Allowable Elevation (+ mlw)	Remaining or Potential Capacity (mcy)	Probable Use
A. Open Water Sites			
1. Patapsco River Mouth	-10'	4	Uncertain
2. Kent Island Deep	-40'	15	Uncertain
3. Pooles Island Deep	-18'	6.5	Uncertain
4. C&D Approaches	-18'	-	Uncertain
B. Containment Sites			
1. C&D Approaches (Federal):			
Courthouse Point	240 acres/+60'	6	2.6
Grove Point	105 acres/+60'	5	Uncertain
Pearce Creek, diked	253 acres/+40'	6.3	6.3
Pearce Creek, undiked	743 acres/+60'	55	Uncertain
2. C&D Canal (Federal):	556 acres	4.9	4.9
3. Baltimore Harbor (Private):			
Hawkins Point (Kennecott)*	85 acres	3	Uncertain
Masonville (Arundel)*	50 acres (variable)	2	Uncertain

2. PROPOSED SITES	Proposed Elevation	Estimated Capacity (mcy)	Probable Use (mcy)
A. Baltimore Harbor			
W. of Colgate Creek	+10'	9.8	
N. of Sollers Point	+10'	9.5	
S. of Sollers Point	+10'	8.0	
Masonville	+10	11.1	
Wagners Point	+10'	6.8	up to 32
Curtis Bay	+10'	4.7	
Thomas Cove	+10'	1.7	
Kennecott/B&O	+10'	13.5	
B. Hart-Miller Islands	+18	52	52

*Dike height and therefore capacity is subject to change; maximum potential height is unknown.

WRA - 1976

ECONOMICS OF THE PROJECT PLAN

INTRODUCTION

20. The economic justification of the proposed plan is determined by comparing the average annual charges (i.e., interest, amortization of total cost, operation and maintenance costs) with the average annual benefits which would be realized over the 50-year economic life of the project. Costs and benefits were converted to an equivalent time basis using a 7-3/8 percent interest rate. All costs and benefits are based on February, 1981 price levels.

COSTS

21. The estimated first costs and annual charges by channel segment for the authorized plan of improvement are presented in Table L-4. These charges are based on estimates of first costs presented in Section O and operation and maintenance costs presented in Section N. Total first cost for the project is estimated to be $301,530,000, of which $232,850,000 is the Federal share and $68,680,000 is the non-Federal share. Costs for construction of the disposal area and operation and maintenance of the disposal area are allocated to channel segment based on the volume of material to be dredged from each segment in Maryland.

22. Interest during construction is the economic cost of the monetary capital tied up during the construction period before the project begins to return benefits, and represents the opportunity cost for that money. Interest during construction is based on a six-year construction period, starting with the construction of the disposal area in 1981, initiation of dredging in 1983, and completion of dredging in 1986. The interest is computed at compound interest, based on the Federal discount rate of 7 3/8 percent, considering the actual expenditure pattern over the construction period.

BENEFITS

23. Annual benefits, as estimated in Section P, are based on savings in water transportation costs by providing deeper channels for the iron ore and coal trades in the Curtis Bay and Main Channels, for petroleum imports in the Northwest Branch-East Channel, and for bulk sugar imports and grain exports in the Northwest Branch-West Channel. With deeper channels, shippers in the bulk trades can use the larger, more economical deep-draft vessels and load those vessels more fully, reducing their per-ton shipping cost. Table L-5 presents the benefits by commodity and trade area for deepening the channels to the authorized depths. In Table L-6, the benefits are presented by major channel segments.

JUSTIFICATION

24. The estimated annual benefits, annual charges, the ratio of benefits to costs, and net annual benefits for the authorized plan of improvement are shown in Table L-7. Annual costs and benefits have been separated for the East Channel of the Northwest Branch into two groupings - 39 feet to 42 feet and 42 feet to 50 feet - to show the economic justification for deepening the East Channel to the existing authorized depth of 42 feet in the main channel. Since deepening to 42 feet is justified, costs and benefits of further improvements to utilize the authorized 50-foot main channel are included with the main channel. As Table L-7 shows, deepening the main channels to 50 feet is justified with a benefit-cost ratio of 5.0 to 1.0. The total project, including the Northwest Branch channels, is justified with a benefit-cost ratio of 5.5 to 1.0.

TABLE L-4

ESTIMATES OF ANNUAL CHARGES
($1000; February 81 Price Level)

	Main Channel and Curtis Bay	Northwest Branch-East Channel	Northwest Branch-West Channel
A. Federal Costs			
1. Federal Investment			
a. First cost	$222,150	$ 6,100	$ 4,600
b. Interest during construction	31,416	454	167
Total Federal Investment	$253,566	$ 6,554	$ 4,767
2. Federal Annual Charges			
a. Interest and Amortization	$ 19,249	$ 498	$ 362
b. Additional maintenance	1,647	0	0
c. Aids to Navigation	14	0	0
Total Federal Annual Charges	$ 20,910	$ 498	$ 362
B. Non-Federal Costs			
1. Non-Federal Investment			
a. First cost	$61,360	$4,770	$2,550
b. Interest during construction	16,865	225	0
Total Non-Federal Investment	$78,225	$4,995	$2,550
2. Non-Federal Annual Charges			
a. Interest and Amortization	5,938	379	$ 194
Total Non-Federal Annual Charges	$ 5,938	$ 379	$ 194
Total Annual Charges	$ 26,848	$ 877	$ 556

TABLE L-5

AVERAGE ANNUAL SAVINGS BY COMMODITY
($1,000; February 1981 Price Levels)

IMPORTS	
Iron Ore	
Canada	$ 4,027
Brazil	2,379
Liberia	4,152
Total	$10,558
Petroleum	$ 4,036
Sugar	
Americas	$ 2,276
Other World	3,748
Total	$ 6,024
Total Imports	$20,618
EXPORTS	
Coal	
Japan	$ 14,375
Europe	111,420
Total	$125,795
Grain	
W. Europe	$ 4,611
E. Europe	2,015
Mid-East	1,405
Asia	2,012
Total	$10,043
Total Exports	$135,838
TOTAL COMMERCE	$156,456

TABLE L-6

AVERAGE ANNUAL SAVINGS BY CHANNEL SEGMENT
($1,000; February 1981 Price Level)

Main Channel and Curtis Bay	
Iron Ore	$ 10,558
Coal	125,795
Total	$136,353
Northwest Branch-East Channel	
Petroleum	$ 4,036
Northwest Branch-West Channel	
Grain	$ 10,043
Sugar	6,024
Total	$ 16,067
TOTAL PROJECT	$156,456

TABLE L-7

SUMMARY OF ECONOMIC JUSTIFICATION

	Existing Depth	Authorized Depth	Annual Benefits ($1000)	Annual Costs ($1000)	Benefit-Cost Ratio	Net Benefits ($1000)
Main Channel to Ft. McHenry, Curtis Bay, and NW-East Channels 1/	42'	50'	$137,699	$27,545	5.0	$110,154
Northwest Branch-East Channel	39'	42'	2,690	180	14.9	2,510
Northwest Branch-West Channel	35'	40'	16,067	556	28.9	15,511
Total Project, All Channels	—	—	156,456	28,281	5.5	128,175

1/ Costs and benefits for Northwest Branch-East Channel are for incremental deepening from 42 to 49 feet only.

SECTION M

SCHEDULES FOR DESIGN AND CONSTRUCTION

1. The schedule developed for the project will enable completion of all dredging work over a period of 3 years and 3 months, which would be followed by a period of continued environmental monitoring of the effects of the dredging project. This optimum schedule is based on the following assumptions:

a. Project funding is provided at the high level required to meet the optimum construction schedule.

b. All material being dredged from the Maryland channels will be placed in the Hart/Miller diked containment facility to be completed by 1 July 1983. The total quantities to be placed in the facility will be based on the sum of new work including non-pay overdepth of dredged material.

c. Environmental baseline studies for the overboard dredged material placement sites in Virginia (Wolf Trap & Rappahannock Shoal) are completed such that no delays in initiation of dredging in the York Spit and Rappahannock Shoal channels occur.

d. Up to three contractors could work effectively at the same time in the Maryland channels, and two contractors could be working simultaneously in the Virginia channels.

e. No additional environmental windows are imposed by regulatory agencies.

f. All private channels in Baltimore Harbor will be dredged by their respective owners such that they will be operational by September 1986.

2. A major constraint to the optimum schedule could be the level of funding required to complete the project in a little over three years. Large appropriation would be required in Fiscal years 1983 through 1986 to attain this schedule. If these appropriations are not forthcoming, the project schedule would be lengthened and project costs increased accordingly. See Section O for a discussion of project cost changes due to longer construction schedules.

3. The current schedule is based on an average production rate of 28 million cubic yards dredged per year for Maryland and Virginia. Discussions with representatives of three individual dredging contractors, and with representatives of the Corps' Water Resources Support Center (Dredging Division) have indicated that private industry has the capability to handle such production using present resources.

4. Construction could begin in FY 1983 in the Maryland channels upon completion of the Hart/Miller containment facility, and in FY 1983 in the Virginia channels, subject to the availability of adequate funds. Project completion would then be scheduled for September 1986, contingent on the assumptions stated above. It is noted, however, that environmental monitoring of the effects of the dredging project will continue for a period of years.

5. Engineering and Design is estimated at 3 percent of the initial construction costs in addition to the costs of environmental monitoring of construction, and Supervision and Administration is estimated at 5.5 percent of the initial construction costs. Since the recommended plan alignment is identical to the authorized plan, no relocation or realignment of the channels is required, with one minor exception. The Northwest Branch-East Channel will be realigned in order to allow for the Fort McHenry Tunnel. The design of the project will consist of a more detailed foundation exploration and updated condition hydrographic surveys conducted immediately preceding each dredging contract and throughout the life of each contract as required to determine accurate dredging quantities. Instrumentation will also be developed as necessary to assure that accurate controls are established and maintained for determining dredge quantities.

6. The 3-year schedule for dredging the Virginia channels is based on dredging by hopper dredge. The estimates of time and cost to dredge the Virginia channels were computed using the operating characteristics of the Corps hopper dredge "Comber", then indexed to approximate private industry cost. The environmental windows (see Section K, paragraph 73) are considered as requested by the environmental agencies. The schedule is based on disposal of the material from Cape Henry in the Norfolk Disposal Site, York Spit material in the Wolf Trap disposal area, and material dredged from the Rappahannock section in the Rappahannock Shoal disposal area.

7. The schedule for the dredging of the Maryland channels is contingent on the completion of the Hart and Miller Islands disposal area by July 1983. The estimates of time and costs to dredge the Maryland channels are based on utilizing a bucket dredge and small scows with disposal in Hart and Miller Islands. The schedule is based on placing 18 million cubic yards per year at Hart and Miller Islands. Provisions for short distance pumping of materials into the containment area were also taken into account. The scows would be transported to the rehandling facility by medium size tugs, at which point their payload would be slurried and pumped into the containment area. The rehandling facility would be located approximately 2500 feet from the Hart and Miller Islands facility, in a location which will permit unrestricted access by the tugs and scows, without encountering shallow water.

SECTION N

OPERATION AND MAINTENANCE

VIRGINIA CHANNELS

1. The maintenance plan for the Virginia channels will consist of periodic maintenance dredging of the channels and periodic maintenance of aids to navigation in the channels areas. Disposal of the material will be in the same areas as the disposal of the initial dredging, i.e., placement in the Norfolk site and, possibly, Fort Story, of material dredged from the Cape Henry Channel, placement in the Wolf Trap site of material dredged from the York Spit Channel and placement in the Rappahannock Shoal site of material dredged from the Rappahannock Shoal Channel. The current estimated maintenance dredging requirement for the existing 42 foot deep Virginia channels is 345,500 cubic yards per year. It is estimated that deepening the channels to 50 feet will increase the annual maintenance dredging requirement by 354,000 cubic yards per year. It should be noted that no increase in maintenance is expected in the Rappahannock Shoal Channel.

2. Annual maintenance costs of dredging have been developed based on the use of private industry hopper dredges. Annual maintenance costs of the aids to navigation have been furnished by the United States Coast Guard. Table N-1 indicates the annual maintenance costs for the Virginia channels.

MARYLAND CHANNELS

3. The currently estimated maintenance dredging requirement for the existing 42 foot deep Maryland channels is 625,700 cubic yards per year. It is estimated that deepening the channels to 50 feet will not increase the annual maintenance dredging and, therefore, no additional maintenance costs are attributable to the project. It is estimated that the Hart-Miller Island site will be able to accommodate the first 10 years of the existing maintenance dredging from the channels after the initial new work disposal operation is completed. Maintenance dredging for the remainder of the project life will have to be placed in one or more of the additional disposal areas being considered by the State of Maryland. These sites have been discussed previously in the section entitled, "Project Plan."

4. Operation and maintenance costs for the diked disposal area at Hart-Miller Islands have been incorporated in the first cost of non-Federal interests. This cost has been furnished by the State of Maryland.

5. Deepening of the Maryland Channels would also require extending to the necessary depth contours. The extension of the channels would necessitate additional aids to navigation. Therefore, annual maintenance costs of new aids to navigation have been furnished by the United States Coast Guard. Table N-1 indicates the annual maintenance cost for the Maryland channels. Maintenance quantities shown in Table N-1 are based on existing conditions of the channels, and an increase in depth and length associated with both channels. The frequency of maintenance dredging in Cape Henry and York Spit channels are based on historical information. The cost to maintain the Cape Henry and York Spit channels are based on dredging every 4 and 3 years, respectively.

TABLE N-1

ANNUAL MAINTENANCE COSTS 1/
($1,000; Feb 1981 price level)

	Quantity	Annual Cost
FEDERAL		
Dredging		
Cape Henry Channel	170,000 cy	$ 882 2/
York Spit Channel	184,000 cy	765 2/
Rappahannock Shoal Channel	0 cy	0
Maryland Channels	0 cy	0
Total Dredging	354,000 cy	$1,647
Aids to Navigation		
Virginia Channels	-	$ 9
Maryland Channels	-	5
Total Aids	-	$ 14
Total Federal Maintenance	-	$1,661
NON-FEDERAL	-	$ 0
TOTAL ANNUAL MAINTENANCE	-	$1,661

1/ Includes only additional maintenance costs associated with the channel improvements.

2/ Includes 12% contingencies, 3% E&D, 5.5% S&A

SECTION O

COST ESTIMATE

CURRENT ESTIMATE OF FIRST COST

GENERAL

1. The estimates of construction costs are awardable contract amounts as of February 1981. These estimates are based on the construction schedule discussed in Section M, "Schedule For Design and Construction," and the dredging techniques discussed in Section L, "Project Plan" and Section M. It is recognized that a contract could be bid and awarded that would reflect a different technique, if the contractor determines this to be cost effective and the technique is found to be acceptable to the Contracting Officer. A contingency allowance of 12 percent is included. Engineering and design, and supervision and administration, amounting to 3 percent and 5.5 percent, respectively, are also included. Engineering and Design, and Supervision and Administration costs include condition surveys of all channels, subsurface exploration and testing, instrumentation programs, preparation of plans and specifications, and engineering costs during construction. It should be noted that a cost estimate for the environmental monitoring program is included as part of the total project cost.

QUANTITIES

2. Dredging quantity estimates have been prepared based on hydrographic surveys in the channel areas. The dates of these surveys were January-February 1977 and May-September 1977 for the Virginia and Maryland Channels, respectively. Some maintenance dredging is required in both the Virginia and Maryland Channels to achieve the existing authorized project depth of 42 feet. This dredging requirement is estimated to be 5.4 mcy, the vast majority of which is in Maryland Channels. New project dredging quantities are shown in Table O-1. Based on past dredging experiences in the channels, two feet of allowable overdepth to reflect normal inaccuracies in the dredging process is included in the project cost estimates. Quantity estimates including the allowable overdepth, are shown in Table O-1. Although not a direct project cost, the estimated one foot of non-pay overdepth dredging increases the total dredging and placement time and must be accounted for when determining the capacity of a given disposal area. Non-pay overdepth dredging quantities for the Maryland channels and the Virginia channels are estimated at 5.0 million cubic yards, and 5.8 million cubic yards respectively. Quantities shown in Tables O-2 through O-4 reflect individual awardable contracts. In addition, the quantities reflect the State of Maryland rehandling capabilities for a 3 year, 3 month construction period. Table O-2 shows York Spit is separated into four sections. The four sections would enable two contractors to work efficiently in the Virginia Channels.

TABLE O-1

DREDGING QUANTITIES (1000 cy)

MARYLAND AND VIRGINIA CHANNELS

MARYLAND CHANNELS	Depth*	Quantity
Craighill Entrance and Craighill Channel	50'	10,828
Craighill-Cutoff Angle and Cutoff Section	50'	7,350
Cutoff Brewerton Angle and Brewerton Section	50'	7,757
Brewerton-Ft. McHenry Angle and Ft. McHenry Section	50'	9,235
Curtis Bay Channel	50'	3,080
Northwest Branch-East Channel	49'	1,673
Northwest Branch-West Channel	40'	1,285
Maryland Channels Total		41,208
VIRGINIA CHANNELS		
Cape Henry Channel	50'	2,515
York Spit Channel	50'	19,470
Rappahannock Shoal Channel	50'	8,603
Virginia Channels Total		30,588
Maryland and Virginia Channels Total		71,796
PRIVATE CHANNELS		
Mooring Basin for Marley Neck Terminal		185
Channel to Kentucky-Ohio Transportation Company		98
Channel to Bethlehem Steel Corporation Ore Pier		1,568
Channels to C&O/B&O Coal and Ore Pier		222
Channel to Consolidation Coal Company		185
Channel to Exxon Company Pier		77
Locust Point Pier 7		130
Private Channels Total		2,465

Note: Quantities include 2 feet allowable pay overdepth. Quantities do not include 1 foot non-pay overdepth or existing project maintenance requirements.

UNIT COSTS

Virginia Channels

3. Costs to be incurred by hopper dredge operations in the Cape Henry, York Spit, and Rappahannock Shoal Channels were prepared in accordance with procedures outlined in the hopper dredge manual. They have been prepared using the disposal methods outlined in the preceding paragraphs on dredged material disposal. The methods are overboard disposal in the Norfolk site in the Atlantic Ocean of material removed from the Cape Henry Channel and disposal of material from the York Spit and Rappahannock Shoal Channels overboard in the Wolf Trap and Rappahannock Shoal sites, respectively, in the Chesapeake Bay. These disposal areas are shown on Figures L-1, L-2, and L-3.

4. The estimates have been prepared using private industry hopper dredges. The cycle time per load, quantity per load, effective working time, etc., were estimated for each of the dredges in the various channel sections. The production parameters are based on current foundation investigations as presented in Appendix B of Technical Appendices, and previous new work dredging experience in the Virginia Channels. In addition, meetings and discussions with private industry representatives have indicated that based on the available information, production rates developed for the Maryland and Virginia Channels are reasonable. From this information, the time to complete the channel dredging was computed. Using the current rental rates for the dredges, the total costs for each channel section and the unit costs per cubic yard were computed. An average unit cost was developed for each unit (contract) by dividing the total dredging cost for that unit over the contract period by the total quantity in cubic yards. Cost estimates, including the unit costs, for the Cape Henry, York Spit, and Rappahannock Shoal Channels are shown in Table O-2.

5. A cost estimate to stockpile dredge material at Fort Story, Virginia was investigated. Suitable material would be removed from the Cape Henry Channel and placed onshore at Fort Story. The cost estimate has been prepared using private industry hopper dredges. Table L-1 shows a cost comparison of disposing Cape Henry dredge material at the Ocean site versus stockpiling at Fort Story, Virginia. While the Fort Story alternative could become a part of the project, cost to implement the scheme would be financed by non-Federal interests during construction. This cost would be in addition to and is considered separate from the current total project cost.

Maryland Channels

6. Cost estimates for dredging operations in the Main Ship Channels and Branch Channels are based on bucket dredging with disposal of the dredged material in the Hart-Miller Island diked disposal area. The State of Maryland has designed the diked disposal area and construction is scheduled to begin this year. The disposal area, shown on Figure L-4, is located about five miles northeast of the Cutoff-Brewerton Angle. The State plans to construct the disposal area with a capacity sufficient to accommodate dredged material from Baltimore Harbor for the initial deepening to 50 feet and 10 years of maintenance dredging. There will not be a handling basin at the disposal area. Scows will be transported to a rehandling facility by medium size tugs at which point their payload would be slurried and pumped into the containment area. The rehandling facility would be located approximately 2500 feet from the Hart and Miller Islands' facility, in a location which will permit unrestricted access by the tugs and scows, without encountering shallow water. The first costs for the diked disposal area is a non-Federal expense. The construction cost and the operation and maintenance cost of the diked

area, provided by the Maryland Port Administration, has been apportioned among the Main Ship, Branch Channel, and Private Channel sections by the amount of material to be dredged from a given section and placed in the area.

7. Other non-Federal costs include relocation of electrical cables located under the East Channel of the Northwest Branch. The relocation is shown on Plate A-31, Appendix A. Cost estimates for the Main Ship Channel and Branch Channels are shown in Tables O-3 and O-4, respectively.

Private Channels

8. The estimated costs of private channels are shown in Table O-5. The cost is based on disposing of the material at Hart-Miller Islands.

Utility Relocations

9. The deepening of the Northwest Branch - East Channel to 49 feet will require the relocation of 12 submarine electric cables owned by the Baltimore Gas and Electric Company, running from Lazaretto Point to Fort McHenry. These will have to be lowered a minimum of 9 feet. A detailed description of the above relocation is presented in Section H, Investigations. Table O-6 shows the cost for the relocation.

TABLE O-2

ESTIMATED COSTS ($1,000) OF VIRGINIA CHANNELS

(February 1981 Price Level)

CAPE HENRY CHANNEL & YORK SPIT CHANNEL (Sections 1&2)	
Quantity - 12,487,000 cy	
Contract Costs @ $2.70/cy	33,700.0
Contingencies (12%)	4,000.0
Engineering & Design (3%)	1,100.0
Supervision & Administration (5.5%)	2,100.0
TOTAL COST - CORPS OF ENGINEERS	40,900.0
YORK SPIT CHANNEL (Sections 3&4) & RAPPAHANNOCK CHANNEL	
Quantity - 18,100,000 cy	
Contract Costs @ $1.84/cy	33,300.0
Contingencies (12%)	4,000.0
Engineering & Design (3%)	1,100.0
Supervision & Administration (5.5%)	2,100.0
TOTAL COST - CORPS OF ENGINEERS	40,500.0
TOTAL COST - CORPS OF ENGINEERS VIRGINIA CHANNELS	81,400.0

TABLE O-3

ESTIMATED COSTS ($1,000) OF MAIN SHIP CHANNEL

(February 1981 Price Level)

MAIN SHIP CHANNELS

a. Craighill Entrance and Craighill Channel

Quantity - 10,828,000 cy	
Contract Costs @ $3.20/cy	34,600.0
Contingencies (12%)	4,200.0
Engineering & Design (3%)	1,100.0
Supervision & Administration (5.5%)	2,200.0
TOTAL COST - CORPS OF ENGINEERS	42,100.0

b. Craighill-Cutoff Angle and Cutoff Section

Quantity - 7,350,000 cy	
Contract Costs @ $2.77/cy	20,400.0
Contingencies (12%)	2,400.0
Engineering & Design (3%)	700.0
Supervision & Administration (5.5%)	1,200.0
TOTAL COST - CORPS OF ENGINEERS	24,700.0

c. Cutoff-Brewerton Angle and Brewerton Section

Quantity - 7,757,000 cy	
Contract Costs @ $2.75/cy	21,300.0
Contingencies (12%)	2,600.0
Engineering & Design (3%)	700.0
Supervision & Administration (5.5%)	1,300.0
TOTAL COST - CORPS OF ENGINEERS	25,900.0

d. Brewerton - Ft. McHenry Angle and Ft. McHenry Section

Quantity - 9,235,000 cy	
Contract Costs @ $3.10/cy	28,600.0
Contingencies (12%)	3,400.0
Engineering & Design (3%)	1,000.0
Supervision & Administration (5.5%)	1,800.0
TOTAL COST - CORPS OF ENGINEERS	34,800.0
TOTAL MAIN SHIP CHANNELS COST - CORPS OF ENGINEERS	127,500.0

TABLE O-3 (con't)

ESTIMATED COSTS ($1,000) OF MAIN SHIP CHANNEL
(February 1981 Price Level)

NON-FEDERAL COSTS	
Diked Disposal Area	27,339.0
Operations and Maintenance for Diked Disposal Area	18,200.0
TOTAL NON-FEDERAL COST	45,539.0
TOTAL MAIN SHIP CHANNELS COST	173,039.0

TABLE O-4

ESTIMATED COSTS ($1,000) OF BRANCH CHANNELS

(February 1981 Price Level)

CURTIS BAY CHANNEL	
Quantity - 3,080,000 cy	
Contract Costs @ $2.57/cy	7,900.0
Contingencies (12%)	900.0
Engineering & Design (3%)	300.0
Supervision & Administration (5.5%)	500.0
TOTAL COST - CORPS OF ENGINEERS	9,600.0
NON-FEDERAL COSTS	
Diked Disposal Area	2,161.0
Operations and Maintenance for Diked Disposal Area	1,600.0
TOTAL NON-FEDERAL COST	3,761.0
TOTAL PROJECT COST	13,361.0

TABLE O-4 (cont'd)

ESTIMATED COSTS ($1,000) OF BRANCH CHANNELS
(February 1981 Price Level)

NORTHWEST BRANCH - EAST CHANNEL

Quantity - 1,673,000 cy	
Contract Costs @ $2.99/cy	5,000.0
Contingencies (12%)	600.0
Engineering & Design (3%)	200.0
Supervision & Administration (5.5%)	300.0
TOTAL COST - CORPS OF ENGINEERS	6,100.0
NON-FEDERAL COST	
Diked Disposal Area	1,170.0
Operations and Maintenance for Diked Disposal Area	900.0
TOTAL NON-FEDERAL COST	2,070.0
TOTAL PROJECT COST	8,170.0

NORTHWEST BRANCH - WEST CHANNEL

Quantity - 1,285,000 cy	
Contract Costs @ $2.94/cy	3,800.0
Contingencies (12%)	500.0
Engineering & Design (3%)	100.0
Supervision & Administration (5.5%)	200.0
TOTAL COST - CORPS OF ENGINEERS	4,600.0
NON-FEDERAL COSTS	
Diked Disposal Area	900.0
Operations and Maintenance for Diked Disposal Area	600.0
TOTAL NON-FEDERAL COST	1,500.0
TOTAL PROJECT COST	6,100.0
TOTAL BRANCH CHANNELS COST - CORPS OF ENGINEERS	20,300.0
TOTAL BRANCH CHANNELS COST - NON-FEDERAL	7,331.0
TOTAL BRANCH CHANNELS COST	27,631.0

TABLE O-5

ESTIMATED COSTS ($1,000) OF PRIVATE CHANNELS

(February 1981 Price Level)

CHANNEL TO BETHLEHEM STEEL CORPORATION ORE PIER	
Quantity - 1,568,000 cy	
Contract Costs @ $2.81/cy	4,400.0
Contingencies (12%)	530.0
Operations and Maintenance for Diked Disposal Area	700.0
Diked Disposal Area	1,300.0
Engineering & Design (3%)	200.0
Supervision & Administration (5.5%)	270.0
TOTAL COST	7,400.0
CHANNELS TO C&O/B&O COAL AND ORE PIERS	
Quantity - 222,000 cy	
Contract Costs @ $4.22/cy	940.0
Contingencies (12%)	110.0
Operations and Maintenance for Diked Disposal Area	100.0
Diked Disposal Area	160.0
Engineering & Design (3%)	30.0
Supervision & Administration (5.5%)	60.0
TOTAL COST	1,400.0
CHANNEL TO CONSOLIDATION COAL COMPANY	
Quantity - 185,000 cy	
Contract Costs @ $4.28/cy	790.0
Contingencies (12%)	95.0
Operations and Maintenance for Diked Disposal Area	90.0
Diked Disposal Area	160.0
Engineering & Design (3%)	25.0
Supervision & Administration (5.5%)	50.0
TOTAL COST	1,210.0
CHANNEL TO EXXON COMPANY PIER	
Quantity - 77,000 cy	
Contract Costs @ $6.23/cy	480.0
Contingencies (12%)	60.0
Operations and Maintenance for Diked Disposal Areas	30.0

TABLE O-5 (con't)

ESTIMATED COSTS ($1,000) OF PRIVATE CHANNELS
(February 1981 Price Level)

Diked Disposal Area	80.0
Engineering & Design (3%)	20.0
Supervision & Administration (5.5%)	30.0
TOTAL COST	700.0
CHANNEL TO LOCUST POINT PIER 7	
Quantity - 130,000 cy	
Contract Costs @ $4.79/cy	620.0
Contingencies (12%)	80.0
Operations and Maintenance for Diked Disposal Area	50.0
Diked Disposal Area	240.0
Engineering & Design (3%)	20.0
Supervision & Administration (5.5%)	40.0
TOTAL COST	1,050.0
CHANNEL TO KENTUCKY-OHIO TRANSPORTATION CO. PIER	
Quantity - 98,000 cy	
Contract Costs @ $5.62/cy	550.0
Contingencies (12%)	65.0
Operations and Maintenance for Diked Disposal Area	40.0
Diked Disposal Area	130.0
Engineering & Design (3%)	20.0
Supervision & Administration (5.5%)	35.0
TOTAL COST	840.0
MOORING BASIN FOR MARLEY NECK TERMINAL	
Quantity - 185,000 cy	
Contract Costs @ $4.28/cy	790.0
Contingencies (12%)	95.0
Operations and Maintenance for Diked Disposal Area	90.0
Diked Disposal Area	160.0
Engineering & Design (3%)	25.0
Supervision & Administration (5.5%)	50.0
TOTAL COST	1,210.0
TOTAL PRIVATE CHANNELS COST	13,810.0

TABLE O-6

UTILITY RELOCATION COST ($1,000)
(February 1981 Price Level)

Electrical Cable Relocation	$2,000.0

SUMMARY AND COMPARISON OF ESTIMATES OF FIRST COST

10. Table O-7 shows a summary of the present estimate of first costs. In Table O-8, the present estimate of first costs is compared with the cost estimate contained in the Project Document, the 1975 Supplemental Report to the Project Document and to the latest approved estimate (PB-3), effective 1 October 1980.

11. The present estimate of cost reflects the project being constructed in a three year time period. Dredging at this rate would require all major contracts to run simultaneously. Should this construction schedule be lengthened for any reason, the project cost estimate will also change accordingly. A longer project schedule would require lengthier dredging contracts and/or "sequencing" of award of major contracts during the overall project duration. Cost escalations would result in all contracts, particularly those awarded several years after initial project dredging. The following comparisons of project costs reflect all additional cost escalations for longer project schedules. The project costs discussed are, therefore, actual anticipated financial costs. A construction schedule of eight years has been considered in previous planning for the Baltimore Harbor and Channels Project. Adoption of the eight year schedule would result in the first cost of the project being approximately $375,230,000. This represents an increase of $73,700,000 ($56,800,000 Federal and $16,900,000 non-Federal) over the cost of the project based on a three year construction schedule. Similarly, if a construction schedule of six years is eventually realized, the first cost of the project would be approximately $339,080,000. This represents an increase of $37,550,000 ($25,650,000 Federal and $11,900,000 Non-Federal) over the cost of the project based on a three year construction schedule.

12. Table O-8 shows comparisons of estimated project first costs for various report document investigations for the Baltimore Harbor and Channels, Maryland and Virginia Navigation study. An explanation for the project cost increase between current (February 1981) and PB-3 (October 1980) cost estimates is discussed below.

<u>Federal Costs:</u>

VIRGINIA CHANNELS - Total cost increase of $24,260,000.0. The increase represents $3,200,000.0 for price level rise and $21,060,000.0 for reanalysis of unit prices based on accomplishing the work by private, in lieu of Government hopper dredges.

MARYLAND CHANNELS - Total cost increase of $31,770,000.0. The increase represents $5,900,000.0 for price level rise and $25,870,000.0 for reanalysis of unit prices.

ENGINEERING AND DESIGN (OTHER) - Cost increase of $2,010,000.0. Commensurate with increased construction estimate.

ENGINEERING AND DESIGN (MONITOR) - Cost increase of $1,240,000.0. Reflects refinement in cost estimate.

SUPERVISION AND ADMINISTRATION - Cost increase of $3,420,000.0. Commensurate with increased construction cost estimate.

Non-Federal Costs:

DREDGING - Cost increase of $3,860,000.0. The increase represents $450,000.0 for price level rises and $3,410,000.0 based on GDM studies. The $3,410,000.0 includes $1,580,000.0 due to the addition of two private channels recently identified during GDM and the $1,830,000.0 represent refinements in the cost estimate.

WATER MAIN RELOCATION - Relocation being accomplished as part of city tunnel contract to extend Interstate Route 95.

DIKE OR DISPOSAL AREA, AND OPERATIONS AND MAINTENANCE FOR DIKED DISPOSAL AREA - Cost decrease of $42,500,000 reflects a $43,170,000 decrease due to refinement of the cost estimate, partially offset by an increase of $670,000 for price level rises.

INSTALLATION OF NEW POWER CABLES - Cost increase of $240,000.0. The increase represents $60,000.0 for price level rises and $140,000.0 reflects refinements in the cost estimate.

TABLE O-7

SUMMARY OF ESTIMATED FIRST COSTS ($1,000)
(February 1981 Price Level)

FEDERAL COSTS	
Dredging	
Virginia Channels[1]	$ 75,100.0
Maryland Channels[1]	136,200.0
Engineering and Design	6,300.0
Supervision and Administration	11,600.0
Aids to Navigation	150.0
Monitoring Program	3,500.0
TOTAL FEDERAL COSTS	$232,850.0
NON-FEDERAL COSTS	
Dredging	
Private Channels[2]	$ 10,480.0
Diked Disposal Area	33,800.0
Operations and Maintenance for Diked Disposal Area	22,400.0
Electric Cable Relocation	2,000.0
TOTAL NON-FEDERAL COSTS	$ 68,680.0
TOTAL PROJECT COSTS	$ 301,530.0

1/ Includes contingencies

2/ Includes contingencies, engineering and design, and supervision and administration; excludes apportioned cost for disposal area which are included in the separate cost summary for the disposal area.

TABLE O-8

COMPARISON OF ESTIMATED FIRST COSTS ($1,000)

Cost Account Number	Item	Current Estimate (Feb 81 price level)	October 80 PB-3 Estimate (Oct 80 price level)	July 74 Supplement Estimate (July 73 price level)	Project Document (Jan 69 price level)
09.	CHANNELS	211,300.0	155,270.0	77,529.0	87,864.0
	Virginia	(75,100.0)	(50,840.0)	(42,000.0)	(42,980.0)
	Maryland	(136,200.0)	(104,430.0)	(35,529.0)	(44,884.0)
30.	ENGR & DESIGN	9,800.0	6,550.0	2,360.0	2,870.0
	Monitoring	(3,500.0)	(2,260.0)	—	—
	Other	(6,300.0)	(4,290.0)	(2,360.0)	(2,870.0)
31.	SUPV. & ADMIN.	11,600.0	8,180.0	4,819.0	5,300.0
Total Corps of Engrs.		232,700.0	170,000.0	84,708.0	96,034.0
Coast Guard		150.0	150.0	238.0	73.0
Total Federal Cost		232,850.0	170,150.0	84,946.0	96,107.0
NON-FEDERAL COST					
Dredging		10,480.0	6,620.0	3,618.0	2,386.0
Water Main Relocation		0.0	4,320.0	0.0	0.0
Diked Disposal Area		33,800.0	95,300.0	15,682.0	0.0
Operations & Maintenance for Diked Disposal Area		22,400.0	1/	11,761.0	0.0
Installation of New Power Cables		2,000.0	1,760.0	0.0	0.0
Total Non-Federal Cost		$ 68,680.0	$108,000.0	$ 31,060.0	$ 2,386.0
Total Project Cost		$301,530.0	$278,150.0	$116,006.0	$ 98,493.0

1/ Cost for operations and maintenance for diked disposal area are included in $95,300,000.

SECTION P

BENEFITS

INTRODUCTION

1. This section presents an analysis of those factors necessary to estimate the beneficial impacts in transportation savings that would result from the construction of the authorized deepening of the Baltimore Harbor and Channels. The authorized project calls for deepening the main shipping channels from the Cape Henry Channel in Virginia waters to the Fort McHenry Channel in Baltimore Harbor from 42 to 50-feet; the Curtis Bay Channel from 42 to 50 feet; the Northwest Branch-East Channel from 39 to 49 feet; and the Northwest Branch - West Branch Channel from 35 to 40 feet with deepening and extension of the turning basin to 40 feet. The project was evaluated at the current Federal interest rate of 7 3/8 percent with an assumed project economic life of 50 years. Benefits are based on February 1981 price levels.

2. The transportation savings on which the benefits are based are realized by shipping more cargo tonnage per vessel trip, either by loading a vessel more fully or by utilizing larger vessels over the deeper channels, thereby realizing the benefits of economies of scale. By loading a vessel more fully, the fixed voyage costs are distributed over more units of cargo, reducing the total transportation cost per ton. By using larger vessels, although the overall voyage cost is higher, the additional cargo capacity more than offsets this increase to reduce unit transportation costs. It is only in the major bulk trades that vessels require water depths greater than those currently existing in Baltimore Harbor. Benefits would result from the imports of iron ore at Sparrows Point and Curtis Bay, sugar at the head of the Northwest Branch-West Channel, and petroleum by the major receiver in the Northwest Branch-East Channel; and from the exports of coal at various terminals throughout the harbor, and grain from the Northwest Branch-West Channel. The determination of the magnitude of transportation savings involves three major areas of study; commerce analysis and projections, future fleet distribution, and shipping cost analysis. Each is discussed in detail below followed by the computation of total benefits.

COMMERCE ANALYSIS AND PROJECTIONS

INTRODUCTION

3. Baltimore Harbor commerce in 1978 totalled 46,809,090 tons, of which 31,846,630 tons were foreign imports and exports. Bulk cargo accounted for 82 percent of the port's overall commerce and 82 percent of the foreign commerce. A breakdown of the principal bulk movements for 1978 is shown in Table P-1. Analysis of shipping records and interviews with local shipping interests reveals that only major bulk commodities with established trade routes move in sufficient volume to utilize large vessels requiring water depths greater than those presently existing at Baltimore. These commodities are iron ore, coal, grain, petroleum and sugar. Historical movements of these five major commodities are shown in Table P-2. Although significant volumes of other commodities are being transported annually, these commodities are not, for various reasons,

TABLE P-1
BALTIMORE HARBOR
MAJOR BULK MOVEMENTS - 1978

COMMODITY	PRINCIPAL MOVEMENT	VOLUME (1000's Short Tons)
Iron ore	Import	7,161
Coal	Export	5,887
Petroleum:		
Crude	Import	422
Gasoline	Coastwise	388
Jet Fuel	Coastwise	4
Kerosene	Coastwise	4
Distillate Fuel Oil	Import	24
	Coastwise	578
Residual Fuel Oil	Import	2,078
	Coastwise	1,825
Asphalt	Coastwise	746
Grains:		
Wheat	Export	442
Corn	Export	4,345
Soybeans	Export	878
Sugar	Import	472
	Coastwise	26
Molasses	Import	86
Manganese Ore	Import	22
Bauxite	Import	452
Chrome Ore	Import	273
Salt	Import	517
Limestone	Import	716
Fertilizers	Import	217
	Export	16

Source: Waterborne Commerce of the United States, 1978

TABLE P-2
BALTIMORE HARBOR BULK COMMERCE
1969-1978
(thousands short tons)

Year	Iron Ore Imports	Coal Exports	Petroleum Imports	Petroleum Coastwise	Grain Exports	Sugar Imports
1969	10,595	2,658	4,110	2,625	889	661
1970	11,223	4,725	4,399	4,411	1,195	546
1971	9,520	3,435	3,479	4,940	1,232	531
1972	8,417	3,755	4,284	5,487	2,857	614
1973	10,016	4,406	5,306	5,372	3,805	603
1974	13,325	5,977	4,658	5,415	4,314	737
1975	12,076	6,758	3,299	4,380	4,783	511
1976	10,308	6,536	2,668	4,994	6,009	600
1977	6,235	7,054	2,439	5,014	4,965	484
1978	7,161	5,887	4,366	3,693	5,686	473
Average	9,888	5,119	3,901	4,633	3,574	576

Source: Waterborne Commerce of the United States susceptible to the advantages of deep-draft navigation. For example, widespread sources of supply in the world for these commodities, with limited volumes from each point, does not warrant the use of larger bulk carriers.

4. Of note in Table P-2 is the substantial increases in recent years in volumes of coal and grain exports. Benefits for the export of grain were not included in the Project Document. However, due to the increased level of exports and increase in ship sizes carrying the grain, it has been considered in the economic evaluation for the GDM.

5. Detailed investigations were made of the major bulk commodity trades in which navigation benefits are expected to result. Data from 1975 and 1976 were initially used as the baseline for the commerce analysis and projections of all the commodities under study. However, because of dramatic changes in the coal export trade in the past two years, data from 1979 and 1980 shipments were collected and used in the analysis of coal exports. Taking into account local and worldwide economic trends and developments influencing Baltimore Harbor's trade volume, future commerce in each of the major bulk trades was projected over the 50-year project economic life from 1986, the first year the project is estimated to become fully operational, to year 2036. Table P-3 presents the results of these investigations. Characteristics of each commodity trade and considerations in making the projections are discussed below for each commodity.

TABLE P-3
BALTIMORE HARBOR
PROSPECTIVE DEEP DRAFT COMMERCE
(1000 short tons)

Commodity	Existing 1/	1986	2000	2036
Iron Ore	11,903	9,200	9,200	9,200
Residual Fuel 2/	1,640	1,830	2,050	850
Coal	6,424	38,000	54,800	54,800
Grain	4,870	5,470	6,420	9,760
Sugar	616	650	700	780
Total	25,453	55,150	73,170	75,390

1/ 1974-1976 average
2/ NW-East Branch only

IRON ORE

6. During the 1974-1976 period, an average of 11.9 million short tons of iron ore per year was imported into the Port of Baltimore. A large portion of the ore (about 55 percent) was consumed in the Baltimore area by the Bethlehem Steel Corporation's Sparrow Point plant. The remaining iron ore was transshipped to inland locations by rail mainly from two terminals in the Canton and Curtis Bay areas owned by the Cottman Company and the Chessie System (B&O Railroad), respectively. Relatively small volumes move through Port Covington. Table P-4 shows the percent distribution by country of origin for 1975-1976 iron ore imports to Sparrows Point and other harbor piers.

TABLE P-4

BALTIMORE HARBOR IRON ORE IMPORTS (1975-76)
BY PIER AND COUNTRY OF ORIGIN

Country of Origin	Sparrows Point		Canton		Curtis Bay		Pt. Covington		Total	
	short tons	%	short tons	%	short tons	%	short tons	%	short tons	%
Canada	5,162,496	45.2	398,809	7.3	506,775	12.7	-----	---	6,068,080	28.3
Liberia	2,036,142	17.8	257,387	4.7	54,779	1.4	-----	---	2,348,308	10.9
Brazil	1,389,634	12.1	3,407,684	62.6	2,410,848	60.5	230,538	38.6	7,438,704	34.7
Venezuela	2,788,965	24.4	222,639	4.1	749,454	18.8	260,039	43.5	4,021,097	18.7
Australia	------	-----	559,661	10.3	89,222	2.2	-----	----	648,883	3.0
Others	56,818	0.5	595,983	11.0	175,429	4.4	106,974	17.9	935,204	4.4
TOTALS	11,434,055	100.0	5,442,163	100.0	3,986,507	100.0	597,551	100.0	21,460,276	100.0

7. The projections of iron ore imports prepared for the 1969 Project Document were based on the expected regional distribution of projected total United States production of steel. The projections indicated a rate of growth of 1.75 percent annually to 1985, and then 1.6 percent annually during the remaining project life. This rate of growth resulted in a level of imports of 13.6 million short tons in 1975, 20.3 million tons in 2000 and 30.1 million in 2025. Although the 1975 projection is relatively close to the actual tonnage during the 1974-1976 period, the latter figure is not typical of the level of imports experienced during the early 1970's or to be expected during the latter part of the 1970's. For example, during the 1970-1973 period, average annual tonnages averaged 9.8 million tons. The reason for the higher than average tonnage during the 1974-1976 period was an increase in the amount of ore transshipped to inland locations due to a temporary closing of a major iron ore supplier on Lake Superior.

8. The projections prepared for this report were based, in part, on estimates of future iron ore use at the Sparrows Point plant. These projections showed a constant demand for iron ore at the Sparrows Point plant over the projection period. It was assumed that any foreseeable increase in steel production at the plant could be handled by more efficient production techniques or by increasing the iron content of the ore. In either case, the amounts of iron ore required would not be significantly affected.

9. The projections of the amount of iron ore transshipped inland were based on an analysis of the historical trends in tonnages transshipped and conversations with Chessie System, Cottman Company and Bethlehem Steel officials. The historical data for the 1962-1973 period indicates no significant trend in the levels of imports to either the Chessie, Cottman, or Western Maryland facility in Port Covington. Imports to the Chessie ore pier ranged between 531,000 tons to 2.0 million tons with the average being 1.0 million tons. At the Cottman facility, the range was between 278,000 tons and 1.2 million tons with an average of 800,000. Imports into Port Covington ranged between 59,000 tons and 542,000 tons, with an average of 328,000 tons. The Bethlehem Steel Company transships iron ore through these two terminals to the company's Johnstown, Pennsylania, plant. Bethlehem Steel officials indicated that the transportation savings realized from a 50-foot channel could result in approximately 2.0 million short tons of iron ore being diverted from Philadelphia to Baltimore for transshipment to the company's plant in Bethlehem, Pennsylvania. In the projections presented in Table P-5, it was assumed that the level of iron ore transshipped would be equal to the average tonnages for the Chessie, Cottman, and Port Covington facilities during the 1962-1973 period. Because of the high degree of uncertainty about the 2.0 million tons of induced tonnage, it was not included in the table.

10. Based on data supplied by local iron ore importers, it was determined that approximately 50 percent of the imports to Baltimore Harbor would originate in Seven Islands, Canada, 34 percent in Buchanan, Liberia, and the remaining 16 percent divided evenly between Palua, Venezuela and Tubarao, Brazil.

TABLE P-5

PROJECTIONS OF IRON ORE IMPORTS
(millions of short tons)

	1974-76 Average	1986	2036
Sparrows Point	6.50	7.05	7.05
Curtis Bay	2.51	1.00	1.00
Canton	2.43	0.80	0.80
Pt. Covington	0.46	0.35	0.35
TOTAL	11.90	9.20	9.20

COAL

GENERAL

11. The United States is the largest producer of bituminous coal and the largest coal exporter in the world. Generally, coal exports from the United States have remained fairly constant since the 1950's, with periodic fluctuations stemming from rail and mine strikes. Table P-6 presents coal export volumes for both the United States and Baltimore for the 1970's. As can be seen, Baltimore's coal exports, both in absolute volume and as a percent of total U.S., have risen steadily and dramatically since the 1960's, when the average annual export volume was only about 2.4 million tons. As shown in Table P-7, the Port of Baltimore is currently the second leading coal export center in the nation, accounting for about twenty percent of the total United States' tidewater export volume. Baltimore's attraction as a coal port is due in part to its proximity to the rich Appalachian coal fields which extend from western Pennsylvania to northern Alabama. The rail lines tieing into Baltimore serve those Appalachian mines located in northern West Virginia, western Pennsylvania, and Maryland. Vast reserves of steam and metallurgical grade bituminous coal are mined in these fields, both types of which are in great demand in foreign markets.

12. Table P-8 is a breakdown of Baltimore coal exports by general area of destination from 1970 through the first ten months of 1980. Historically, Baltimore's major coal customer has been Japan, accounting for about 53 percent of the total volume in the past decade. Europe (including the Mediterranean area) and South America have received 41 and 4 percent, respectively, of the total. The major European customers for Baltimore coal have been West Germany, France, United Kingdom, Belgium, and the Netherlands, while Brazil and Argentina are the major South American importers. Nearly all of Japan's coal, as well as most of the coal to Europe and other countries, has been metallurgical grade coal used in making steel. In the past two years, however, the nature of the Baltimore coal trade (that is, the volume, destination, and type of coal exported) has changed dramatically.

TABLE P-6
COAL EXPORTS, 1970 - 1979
UNITED STATES AND BALTIMORE

Year	Exports (thousands of short tons) U.S.	Baltimore	Percent Baltimore
1970	71,276	4,725	6.6
1971	56,802	3,435	6.1
1972	55,914	3,755	6.7
1973	53,011	4,406	8.3
1974	61,582	5,977	9.7
1975	65,274	6,758	10.4
1976	59,705	6,536	10.9
1977	53,938	7,054	13.1
1978	40,328	5,887	14.6
1979	45,643	9,141	20.0

Source: Waterborne Commerce of the United States, 1970-1978.
U.S. Dept. of Commerce, 1979

TABLE P-7
U.S. EXPORTS OF BITUMINOUS COAL, 1979
(thousands of short tons)

Port of Exit	Tons	Percent of Total
Baltimore	9,141	20.0
Hampton Roads	33,753	74.0
Mobile	1,284	2.8
New Orleans	1,410	3.1
Philadelphia	55	0.1
Total	45,643	100.0

Note: Excludes Great Lakes shipments to Canada and shipments to U.S. military forces

TABLE P-8
BALTIMORE COAL EXPORTS BY TRADE AREA, 1970-1980
(1,000's short tons)

Year	Far East	Europe & Mediterranean	South America	Other	Total
1970	2,602	1,872	251	0	4,725
1971	1,950	1,138	254	92	3,434
1972	2,285	1,188	194	88	3,755
1973	2,684	1,424	189	109	4,406
1974	4,046	1,767	109	55	5,977
1975	5,254	1,105	340	59	6,758
1976	3,786	2,384	339	27	6,536
1977	3,527	3,167	360	0	7,054
1978	2,960	2,738	148	41	5,887
1979	4,151	4,513	465	12	9,141
1980 1/	3,269	6,425	208	110	10,012

1/ 1980 figures are through October

Source: From data supplied by Maryland Port Administration

STEAM COAL BOOM

13. Export volumes from Baltimore are expected to reach 13 million tons in 1980, about double the export totals from as recently as 1977 and 1978. Most of the recent increase has come from a sudden demand in Europe for American steam coal, which now accounts for about one-third of Baltimore's coal export traffic, for use in electrical power generation. Total exports to European and Mediterranean destinations have increased three-fold in recent years, whereas South American and Far East (mainly Japan) totals have remained relatively constant over the long run. The recent coal boom, which has affected not only Baltimore, but all U.S. coal ports, has come about just as the seven major industrial democracies pledged in Venice to double the use of coal by 1990. In addition, the U.S. Senate has required the State Department to designate a coal export officer in every U.S. embassy, and an international group had just published a study calling for a ten-to fifteen-fold increase in world steam coal trade.

14. But the coal boom for the U.S. has come about, not so much because of the above mentioned pronouncements, as they have due to changed demand and supply market conditions around the world. These changed conditions include:

a. European power plants have been and are being converted from oil to coal as a result of rapidly escalating oil prices in 1979 and 1980.

b. The rising price of bunker fuel used by vessels transporting coal has made United States coal more competitive in some markets than more distant suppliers such as Australia and South Africa.

c. For various reasons, traditional coal suppliers are no longer reliable sources. Miners' strikes in Australia, in addition to an unstable political climate and crowded ports in South Africa have meant increased business for the United States. Poland has also been affected by labor and political unrest. Also, the Soviet Union has put a claim on much of Poland's coal, limiting the amount available for export.

15. The demand for U.S. coal has so exceeded the supply capacity of the transportation system that for more than a year, dozens of ships have lain at anchor outside of Baltimore and other American ports typically for more than a month each, waiting to load coal. The Chessie coal pier in Curtis Bay, the port's only coal exporting facility, is now strained to its capacity of about 15 million tons annually. In late 1980, Chessie began barging coal, loaded from the barge side of their pier, to the unused ore pier in Port Covington, where the coal was transferred to ocean-going vessels. This temporary practice increased the loading capacity of the port by about three million tons annually.

16. The strong market demand for coal and optimistic long-range projections have generated enough confidence in the coal export market that private coal interests have announced plans for considerable investment in facilities to increase the harbor's coal export capacity:

a. The Island Creek Coal Company, a subsidiary of Occidental Petroleum has announced two projects representing a $50 million investment. One, already underway, is for a 28-acre coal storage area in the Curtis Bay area, accessible to Chessie's coal pier located nearby. The second project is for a new coal pier, to be located alongside Chessie's pier, having an annual throughput capacity of 12 million tons by 1982.

b. The Consolidation Coal Company (ConSol) is spending $110 million to purchase the Canton ore pier and adjacent properties, convert the ore pier to a coal pier, and construct the necessary support facilities. This initial investment will have an annual capacity of 10 million tons by 1983, with the option of future expansion to 20 million tons capacity.

c. A six company consortium, headed by Soros Associates, a New York engineering firm, has announced plans for a $150 million pier and storage facilities on a 500-acre site at Marley Neck for exporting 15 million tons annually by 1985. A capability exists for further development there which would increase export capacity to 30 million tons.

d. A number of other unannounced proposals have been made for coal-exporting projects throughout the harbor. Two of these proposals, firmly in the negotiating stage, would add another estimated 18 million tons of export capacity.

e. The Chessie System is spending $383 million to upgrade its tracks, equipment, and yards by 1984, to insure its ability to handle the increased volume of exports anticipated.

These planned investments will increase Baltimore's coal export capacity from less than 20 million tons currently to at least 70 million tons, and potentially greater than 100 million tons, within the next decade.

17. Whether the future export capacity will be built, or even whether the capacity currently being built will be fully utilized, is dependent on the future of the current steam coal export boom, which, in turn, is dependent on many variables in the future of energy. The demand for U.S. steam coal has been described by a Chessie official as an

artificial situation and difficult to predict how long it will last. The United States is currently viewed by many as a marginal supplier of steam coal. Much of the recent coal exports have been trial shipments purchased on the spot market. Although some of these trials have resulted in long-term contracts, many European countries have been unwilling to make long-term commitments without improved and new coal-loading facilities to eliminate the costly delays they are now experiencing. However, the construction of the announced investments in Baltimore outlined above, and investment at other U.S. ports, should alleviate the congestion problem and lead to more long-term contracts being made in the next few years.

18. The investments in new coal facilities in Baltimore have taken place, based not only on contracts currently in hand, but on the assumption that there will be an increasing demand for steam coal in the future. Many coal-fired power plants are scheduled to come on line in Europe in 1983. It is anticipated that with continuing oil price escalation and potential future oil shortages, additional conversions and construction of coal-fired utilities will occur, increasing steam coal demand. But it is difficult to accurately forecast what the demand for steam coal exports will be because of a number of factors. The steam coal market is sensitive to the prices of alternative energy sources in the long run. Coal could lose its price advantage over oil if OPEC were to reduce the price of oil significantly. Also, the nuclear industry, which is currently hampered by environmental, social, and political concerns, could recover and take over a larger share of the energy market. Government environmental regulations regarding the burning of coal in foreign countries, which are not as stringent as U.S. regulations, could be tightened (or relaxed in the United States), which could affect the type and volume of coal suitable and available for export. Also, the future level of U.S. coal exports is dependent, not only on U.S. decisions and actions, but on energy and coal developments in each of the major energy-using countries, as well as the quality, availability, price, and reliability of coal supplies from the U.S. in comparison with other coal-exporting countries.

UNITED STATES EXPORT PROJECTIONS

19. There have been a number of recent studies attempting to forecast the magnitude of the future coal market, taking into consideration the uncertainties noted above. While the studies vary substantially in scope, they all forecast a sharp increase in demand for U.S. export coal. The World Coal Study (WOCOL), published in the spring of 1980, is an exhaustive study by representatives from 16 major coal-using and coal-producing countries assessing all aspects of coal supply and demand over the next two decades. WOCOL concluded that world steam coal trade will need to increase by 10-15 times over the next twenty years to satisfy projected demand, and that the U.S. is the only nation capable of exporting more than 200 million tons by year 2000. U.S. exports are projected to increase from the 1979 level of 59 million metric tons to at least 125-200 million metric tons and perhaps as much as 350 million metric tons by year 2000. The U.S. WOCOL team initially assumed year 2000 U.S. export requirements of 125 mtce (millions of metric tons of coal equivalent; 1 mtce is equal to about 1.15 short tons of Appalachian bituminous coal) in the low coal use scenario, and 200 mtce in the high coal use case, based on initial expectations of the likely growth in demand for exports. However, the possibility of greatly expanded demand for U.S. exports up to 350 mtce (WOCOL's "Sensitivity" scenario) was deemed more probable if the WOCOL projections of world coal import requirements are to be satisfied. A summary of the projections for the three scenarios is presented in Table P-9 below.

TABLE P-9
U.S. COAL EXPORT PROJECTIONS - WOCOL
(mtce)

	1985	1990	2000
Steam Coal			
Low Use	20	30	65
High Use	30	60	130
Sensitivity	50(e)	120(e)	280
Metallurgical Coal			
Low Use	50	55	60
High Use	50	60	70
Sensitivity	50	60	70
Total Coal			
Low Use	70	85	125
High Use	80	120	200
Sensitivity	100	240	350

(e) = estimated; not provided by WOCOL

20. Other recent studies estimate total U.S. coal exports in the 100-160 million ton range. These include studies by the U.S. Department of Energy, the U.S. Department of Commerce, the Energy Modeling Forum, and the International Energy Agency. Whereas these studies were considered by WOCOL, they, being 2-3 years old, were made prior to and failed to fully anticipate the advent of the steam coal export boom.

21. As the World Coal Study was being published in the Spring of 1980, the Federal Interagency Coal Export Task Force, comprised of representatives from fourteen Federal departments and agencies headed by the Department of Energy, was being formed at the direction of the President. The Interim Report of the Interagency Coal Export Task Force (ICE), released in January 1981, was based on significant new information developed regarding the international coal market. The report projects U.S. exports to the primary demand areas of the world, Europe and the Far East, of steam coal only. Because of slightly different assumptions, more recent data, and more detailed analyses in some cases, ICE projections of world demand are in the high range of WOCOL projections.

22. The United States export share of the world demand depends on the buying strategies of the consuming countries, the policies and prices of competing exporters, and actions taken by the U.S. to maintain reasonable prices, prompt delivery, and dependable quality. Although the U.S. has the highest delivered prices of coal to both Europe and the Pacific Rim, ICE determined that the price difference was not significant enough to appreciably affect buyers decisions on source of supply. Rather than the cost criterion alone, security and diversification of supply are the major considerations. Table P-10 below summarizes ICE projections of the U.S. share of the primary world demand.

TABLE P-10
U.S. SHARE OF PRIMARY WORLD DEMAND - STEAM COAL
(millions of short tons)

	1985		1990		2000	
	Percent	Tons	Percent	Tons	Percent	Tons
Europe	28%	28	29%	49	47%	145
Pacific Rim	0%	0	17%	15	25%	52
Total	18%	28	25%	64	38%	197

23. The ICE projections of U.S. steam coal exports fall almost exactly mid-way between WOCOL's High Use and Sensitivity scenarios for the year 2000. As shown in Table P-11 below, the projections compare fairly well by geographic area of destination.

TABLE P-11
U.S. STEAM COAL EXPORTS (2000)
ICE vs. WOCOL
(millions of tons)

	WOCOL 1/	ICE
Europe	124	145
Far East 2/	66	52
Other World	15	10 3/
Total	205	207

1/ Mid-point of High Use and Sensitivity scenarios
2/ Japan only for WOCOL, includes other countries for ICE
3/ Not projected by ICE; 10 million estimated as WOCOL 15 million minus other Far East included by ICE

As the ICE projections are more recent and considered more authoritative, they will be used in making projections of Baltimore Harbor's steam coal exports. Although ICE does not project metallurgical coal exports, it does indicate that growth in demand for metallurgical coal, tied to worldwide steel production, is expected to be slow. This is consistent with WOCOL's growth projections of metallurgical coal exports from the U.S. of 1.4 to 2.0 percent per year.

BALTIMORE HARBOR EXPORT PROJECTIONS

24. ICE made no attempt to allocate the total U.S. coal exports to geographical areas or individual ports. Important factors to be considered in projecting Baltimore's share include effective throughput capacity for coal exports, type and availability of coal reserves captive to Baltimore, the competitive position of Baltimore compared with other U.S. ports, the type and volume of existing coal exports from Baltimore, and long-term contracts held by companies exporting through Baltimore. Based on these considerations, Baltimore Harbor's future steam coal export volume was estimated using three different methods, described below.

25. The first method, from a macroeconomic viewpoint, assumes that Baltimore will participate in the steam coal market in proportion to its share of total U.S. steam coal export capacity. Currently, Baltimore has about 18 percent of the total U.S. effective coal export capacity. As discussed previously, 55 million tons of new steam coal capacity is planned for Baltimore for the mid-term. Considering known plans for increased capacity at Baltimore and other U.S. ports, Baltimore's share of U.S. steam coal capacity would be about 25 percent. However, because there likely exist plans for projects at other U.S. ports which are unannounced, Baltimore's share would be closer to 20 percent. This percentage would yield Baltimore Harbor steam coal exports of about 42 million tons in year 2000 (20 percent of U.S. projected 207 million tons).

26. A second macroeconomic method allocates the U.S. total by world area of destination and U.S. coastal area based on competitive factors. Although ICE projects 52 million tons to the Pacific Rim from the United States, Baltimore is not expected to participate in this trade to any great extent. Most of this coal volume will exit from Los Angeles and other west coast ports, and to some extent from the Gulf Coast. Baltimore is expected to capture a significant share of the booming European steam coal market, however. Baltimore is far ahead of other U.S. ports in the process for channel dredging and in new coal export facilities development, which tends to attract and encourage long-term contract commitments. Whereas some industry experts believe that the relative market share of ports won't change much in the future, others believe that Baltimore will be the major growth port. Despite the Gulf Coast ports' recent market share increases, it is more expensive to ship coal to Europe through the Gulf. This is because of more expensive overland and barging rates to the Gulf ports, and the longer ocean voyage from the Gulf than from the East Coast. The Gulf Coast ports are currently very busy and competitive now mainly because of longer waiting times to load at Baltimore and Norfolk. Based on these facts and opinions of industry experts, it was estimated that two-thirds of the U.S. steam coal to Europe will originate on the East Coast. Of this volume, about half will be exported from Baltimore. Other than at Newport News and Baltimore, very little coal export capacity exists on the East Coast, although several projects are in the planning stage. If the proposed projects at Hampton Roads are completed, that port will have (as it does now) a greater throughput capacity than Baltimore, even considering Baltimore's capacity increase of 55 million tons. However, much of the capacity of Hampton Roads, perhaps as much as 50 million tons, will continue to be taken up in the metallurgical coal trades. Most U.S. metallurgical coal comes from mines served by rail lines leading to Hampton Roads. Although Baltimore exports some "met", its reserves are inferior in volume and quality to Hampton Roads'. On the other hand, the prime sources of steam coal are southwestern Pennsylvania, Ohio, Western Maryland, and northern West Virginia. These areas are served by Conrail and Chessie, both serving the Port of Baltimore. A coal company's choice of ports depend almost exclusively on which rail lines serve the mines. Except in a few isolated instances, coal which moves through Baltimore could not be re-routed to other ports (and vice versa). Allocating half of the East Coast's projected exports of European-bound steam coal to Baltimore results in an export volume (year 2000) of about 48 million tons.

27. The third method for deriving Baltimore's future coal export volumes is from a microeconomic, or port level, point of view. As explained previously, the tremendous increase in demand for U.S. steam coal eventually drew out venture capital for construction of many new steam coal export facilities in Baltimore. At the same time, new long-term supply contracts for significant amounts of coal were awarded. At least 55 million tons of new steam coal export capacity are being planned or currently under

construction at Baltimore Harbor. New facilities are not constructed so that their full volume will be reached immediately, but rather so that they may accommodate larger volumes over time. But it is reasonable to assume that a significant portion of this capacity is committed to long-term contracts in order to insure an adequate return on the millions of dollars invested. As competition for long-term contracts throughout the nation is at this time intense, individual coal companies are somewhat reluctant to release information on contracts negotiated. However, a number of major long-term contracts have been announced by the companies investing in new facilities at Baltimore. It has been estimated that over 50 percent of the planned capacity is currently committed to European customers. As an increasing number of conversions to coal from high-priced oil is anticipated in the near future, this percentage is likely to increase as the exporting facilities are actually constructed. Based on the above it is conservatively estimated that a 75 percent utilization factor of the new coal export capacity for Baltimore will be attained by year 2000. This would result in a steam coal export volume of about 42 million tons (75 percent of 55 million tons).

28. The three methods described above for determining future steam coal export volumes from Baltimore all give comparable results, ranging from 42 to 48 millon tons (year 2000). The mid-point of this range, 45 million tons, is selected as the best projection of Baltimore's steam coal exports, all of which are destined for Europe. Export volumes for 1986 are estimated at 30 million tons.

29. Metallurgical coal exports from Baltimore, cyclical in the past, are expected to be cyclical long-term. As explained previously, ICE indicates that the growth in demand for metallurgical coal, tied to worldwide steel production, is expected to be slow. WOCOL, while showing an increase in world coal demand of 3.0 to 3.7 percent annually, projects growth in U.S. metallurgical exports of only 1.4 to 2.0 percent per year. Using the 1.4 percent growth rate, Baltimore's metallurgical coal exports will increase from 7.1 million tons in 1977 to 9.8 million tons in 2000. The breakdown of metallurgical coal exports by world area is shown in Table P-12. Shipments to the Far East are expected to fall off somewhat (from 3.5 to 2.5 million tons), while volumes to other destination will double.

30. Table P-13 shows the combined steam and metallurgical coal export projections from Baltimore. Volumes will increase rapidly from 9.1 million tons in 1979 to 38.0 million in 1986, the project base year, and then by 2.6 percent annually to 54.8 million tons in 2000. Volumes are held constant thereafter because of major uncertainties in the world energy and steelmaking situations.

PETROLEUM PRODUCTS

RESIDUAL FUEL

31. In 1976, approximately 4.4 million short tons of residual fuel were shipped into Baltimore by water. Residual fuel is used by industry, power plants, large commercial establishments, and government for heating and processing purposes. It is not widely used in most geographical areas of the United States since it is not price competitive with other energy sources. In the Baltimore area, as well as along most of the East Coast, residual fuel has remained competitive with other fuels due to the availability of port facilities to handle the less expensive foreign residuals as well as domestic residuals from coastal refineries. In 1976, approximately 47 percent of the inbound receipts at Baltimore were from foreign sources, mainly in the Caribbean area. The majority of the remaining inbound shipments were domestic in origin from either U.S. Gulf Coast or refineries located in the Virgin Islands.

TABLE P-12
BALTIMORE HARBOR
METALLURGICAL COAL EXPORT PROJECTIONS
(millions of short tons)

World Area	1977	1986	2000-2040
Europe & Mediterranean	3.2	4.4	6.5
Far East	3.5	3.0	2.5
S. America & Others	0.4	0.6	0.8
Total	7.1	8.0	9.8

TABLE P-13
BALTIMORE HARBOR COAL EXPORT PROJECTIONS
STEAM AND METALLURGICAL
(millions of short tons)

World Area	1979	1986	2000-2040
Europe & Mediterranean	4.5	34.4	51.5
Far East	4.1	3.0	2.5
S. America & Other	0.5	0.6	0.8
Total	9.1	38.0	54.8

32. Inbound receipts of residual fuel experienced a significant increase starting around 1968-1969. This increase was the result of power plants in the Baltimore area converting from coal to residual oil in order to meet more stringent air quality standards. With the exception of the Calvert Cliffs nuclear power plant, virtually all of the power plants located in the Baltimore area continue to use residual fuel. The slight drop in the level of residual fuel receipts starting in 1975 was the result of a reduction in output by the Baltimore Gas and Electric (BG&E) Company's remaining residual oil-fired plants after the Calvert Cliffs plant began operations.

33. Future residual fuel receipts were not projected separately in the 1969 Project Document. Waterborne receipts of residual and distillate fuels combined were projected in that document and assumed to increase at 3 percent annually until the year 2000 with no growth thereafter. This rate of growth resulted in a projection of 7.7 short tons of residual and distillate fuel receipts (foreign and coastwiSe) in 1975. Actual waterborne receipts of these two commodities in 1975 were 4.75 million short tons. The 1974-1976 average was 5.66 million short tons.

34. Benefits in the 1969 Project Document were calculated for residual fuel receipts at the Exxon terminal located on the Northwest Branch. As was the case in the Project Document, the Exxon Company is the only identified potential beneficiary of a deeper channel for the movement of petroleum products in this analysis. In 1976, the Exxon terminal handled 31 percent of the total residual oil receipts into Baltimore. Virtually all of these receipts were from foreign sources. In addition to commercial and industrial consumers, the Exxon Company supplied approximately 50 percent of the total residual fuel used by BG&E during the 1974-1976 period.

35. The projections presented in Table P-14 are based on information received from the Exxon Company and BG&E.

TABLE P-14

PROJECTIONS OF RESIDUAL OIL RECEIPTS-
EXXON TERMINAL, NORTHWEST BRANCH
(millions of short tons)

Type of Use	1976	1986	2000	2036
Public Utility Use	0.80	0.80	1.20	0.25
Other Use	0.58	1.03	0.85	0.60
TOTAL	1.38	1.83	2.05	0.85

36. It should be noted that the projections of "Other Use" for residual fuel in Table P-14 do not reflect the large future increases in commercial and industrial activity which are expected to take place in the Baltimore area. Expected increases in the prices of petroleum products in general, and imported petroleum products specifically, will most probably result in energy conservation measures being instituted by commercial and industrial users and/or a conversion to other energy sources (e.g., distillate fuel, natural gas, coal).

37. A major uncertainty underlying the projections in Table P-14 concerns the type of fuel burned by power plants. The major coastal fossil fuel plants in the BG&E system have the capability of burning coal as well as residual. If, as part of National energy policy, the decision is made to encourage the use of coal, BG&E could convert to coal at some or all of these plants, thereby reducing residual fuel consumption significantly. The projections presented in Table P-14 assume that residual fuel will continue to be primary energy source for all of BG&E's coastal fossil fuel plants.

OTHER PETROLEUM PRODUCTS

38. The petroleum product movements for which benefits were claimed in the 1969 Project Document were residual fuel and the "clean" products (i.e., gasoline, kerosene, distillate, and jet fuel). Since the Exxon Company has recently begun shipping clean products into Baltimore by pipeline from the Gulf Coast, benefits will not be claimed for these movements in this report. Due to its physical nature, residual fuel is not shipped by pipeline in the Baltimore area.

SUGAR

39. Raw sugar is received in Baltimore by one of the largest sugar refineries in the United States, operated by the American Sugar Refining Company. The raw material is processed for human consumption and distributed into the Mid-Atlantic and Southeastern States south to South Carolina as well as into parts of West Virginia, Pennsylvania, Ohio, and Michigan. In 1976, approximately 600,000 short tons of sugar were shipped into Baltimore, 91 percent of which were foreign imports originating in 18 different countries. The country of origin may vary considerably from year to year. For example, during the 1974-76 period, 27 different countries supplied raw sugar to the Baltimore plant. Coastwise receipts, mainly from Puerto Rico, accounted for the remaining 9 percent of inbound receipts in 1976.

40. The 1969 Project Document projected a level of inbound movements of raw sugar to Baltimore Harbor which increased steadily from the 1966 volume of 650,000 tons to 740,000 tons in 1975, 1,080,000 tons in 2000, and to 1,560,000 tons in the year 2025. This rate of growth was based on the assumption that the Baltimore SMSA was the major market for the processed sugar and the population in the SMSA would increase by 1.5 percent per year (per capita sugar consumption was assumed to remain constant). However, actual inbound movements of sugar during the 1966-1976 period have shown no statistically significant upward trend when related to either SMSA population growth or time.

41. These results can be attributed to several factors. First, as the price of refined sugar has increased during recent years, corn syrup and other types of sweeteners have captured a larger share of the market. Second, of lesser importance, is the fact that the quality of raw sugar has improved over the years due to premiums paid by American Sugar for the higher quality raw material. This trend has tended to increase the refined sugar output/raw sugar input relationship.

42. When raw sugar imports into Baltimore are compared to the multi-state market area population levels over the 1954-1977 period, a statistically significant relationship at the 90 percent level of confidence is derived. Using this relationship and Series E OBERS projections of population for the market area, the projections of raw sugar imports into Baltimore Harbor in Table P-15 were derived. It is expected that coastwise receipts will contribute a somewhat lower share of the total inbound movement due to a decline in Puerto Rico's sugar cane industry.

GRAIN

43. The Port of Baltimore grew to national prominence during the late 18th and early 19th centuries through the exporting of grain. During this period the States of Maryland, Pennsylvania, and Virginia, were considered to be the "breadbasket" of the United States. Since that time, however, grain cultivation has spread westward into the fertile plains of the Midwest and Northwest. Most of the grain grown in these areas is exported through ports in the Northwest, Gulf Coast, and Great Lakes.

44. Benefits were not calculated for the export of grain through Baltimore in the 1969 Project Document. However, due to the significant increases in the level of grain exports since the mid-1960's, and the size of the vessels transporting these commodities to certain destinations, it was considered appropriate that these potential benefits be evaluated in this report. During the 1974-1976 period, Baltimore Harbor exported approximately 4.9 million short tons of grain annually to foreign destinations. The level of grain exports through Baltimore Harbor often exhibit high year-to-year fluctuations due to weather and harvest conditions both in the United States and overseas. In addition, political factors often play a significant role in determining the level and destination of grain exports. The major types of grain exported during the period were corn (58 percent), soybeans and soybean meal (21 percent), and wheat (20 percent). Approximately 60 percent of the grain exported was bound for one of the Western European countries. Roughly equal quantities were exported to Eastern Europe, the Mid-East, and Asia.

TABLE P-15
BALTIMORE HARBOR SUGAR PROJECTIONS
(1,000's of short tons)

Year	Foreign Imports	Coastwise Receipts	Total
1986	570	30	600
1990	620	30	650
2000	700	30	730
2036	750	30	780

45. Exported grain is used as either "feed grain" or "food grain." Feed grain is used primarily as feed for livestock and includes corn and soybean meal. Food grains, mostly wheat and rice, are used primarily for human consumption. It is expected that as per capita income continues to increase in the importing countries, meat consumption, and therefore the demand for feed grains is also expected to increase. On the other hand, the worldwide demand for food grains is expected to remain relatively constant as increased demand due to the population increase are somewhat offset by a change in diet to higher meat consumption per capita.

46. The 1972 Nathan Study was used as the basis for deriving the projections of total grain exports. Although the study is somewhat dated, the projected levels of total exports for the United States of 120 million tons in 2000, corresponds very favorably with the more recent 125 million ton estimate prepared as part of the OBERS Series E' projections prepared by the United States Departments of Agriculture and Commerce. Nathan projections of growth rates in the demand for United States export grain by Western Europe, Africa, Asia to 2000 were applied to actual export tonnages through Baltimore for those geographical areas during the 1974-1976 period. These same growth rates were used to extend the projections to 2036. Table P-16 shows the projections for Baltimore Harbor grain exports to different areas of the world.

TABLE P-16

PROJECTED GRAIN EXPORTS BY DESTINATION
(million short tons)

	1974-1976 ave.	1986	2000	2036
West Europe	2.68	3.03	3.55	5.26
East Europe	0.98	1.09	1.28	1.90
Asia	0.62	0.62	0.62	0.62
Mid-East	0.46	0.57	0.76	1.55
Other	0.13	0.16	0.21	0.43
TOTALS	4.87	5.47	6.42	9.76

47. There are three terminals currently handling grain in Baltimore Harbor. These are CSY (a division of Central Soya) pier in the Canton area, the Indiana grain pier in the Locust Point area of the Northwest Branch, and the Dreyfus grain pier in the Port Covington area. The total projections by area of destination were allocated to the individual terminals based on each terminal's actual share during the mid-1970's. The

relative shares to each of the three elevators is not expected to be affected by the project. Table P-17 shows the projected volumes of exports at each terminal to year 2036.

TABLE P-17

PROJECTED GRAIN EXPORTS BY PIER
(millions of short tons)

Pier Location	1974-76	1986	2000	2036
Locust Point	1.35	1.52	1.78	2.70
Canton	1.89	2.12	2.49	3.79
Port Covington	1.63	1.83	2.15	3.27
Total Harbor	4.87	5.47	6.42	9.76

FLEET COMPOSITION

EXISTING FLEET CHARACTERISTICS

48. In evaluating the deepening of Baltimore Harbor's Channels, the characteristics of the existing and anticipating vessel fleets using the channel must be evaluated. Because deep-draft vessels require 5 feet clearance under the keel to allow for such factors as squat, trim, and maneuverability, plus an additional foot to allow for sinkage in going from fresh to salt water, a vessel with a fully-loaded salt water draft greater than 36 feet, corresponding to 35,000 deadweight tons (DWT), would have to light-load part of its cargo to safely transit Baltimore's 42-foot channel. Of the 1878 vessel trips recorded in 1975-1976 for the five bulk commodities under study, 829 were in vessels greater than 40,000 DWT and 346 were in vessels in the 30-40,000 DWT range. The majority of the large bulk carriers calling on Baltimore are in the iron ore and coal trades, accounting for 594 of the 829 recorded shipments in vessels over 40,000 DWT. The largest vessel calling on the Port was a 160,186 DWT ore/oil carrier, the "M.S. Yemanja," discharging about 100,000 tons of Brazilian iron ore in January 1977, and loading 76,000 tons of coal in September 1977.

FUTURE FLEET CONSIDERATIONS

49. Many factors are involved in determining the sizes of vessels used in any commodity trade and trade route. The criteria for selecting the optimum ship size include volume of trade, distance of transport, controlling depths in both the loading and discharge ports, cargo handling and storage facilities at both terminals, and availability of vessels in the world fleet to move this cargo. Generally speaking, the most efficient vessel size on any trade route is the largest that can be accommodated on that route. Port development in most of the major countries with which Baltimore conducts trade allows accommodation of 100,000 + DWT vessels. Except for special instances, as discussed later in this section, it was assumed that foreign port development in the major high-volume trades will continue to provide depths commensurate with the depths proposed at Baltimore Harbor.

WORLD BULK FLEET DEVELOPMENT

50. The rapid growth of the world dry bulk and tanker fleets, both in terms of overall tonnage and average vessel size, is well documented. The growth of the world dry bulk fleet (including combination ore and oil carriers) from 1958-1976 by DWT group is shown in Table P-18. The average dry bulk ship size has increased from 18,055 DWT in 1966 to 35,732 DWT in 1976, nearly doubling in 10 years. More importantly as far as Baltimore Harbor is concerned, the number of vessels in the world over 40,000 DWT has increased from 155 in 1966 to 1168 in 1976. Table P-19, showing world dry bulk fleet distribution by year built, indicates that as the older vessels are retired, a higher percentage of cargo carrying capacity will be in the larger DWT groups. There was only one dry bulk carrier larger than 85,000 DWT in 1966, an ore/oil carrier of 144,000 DWT capacity. By 1976, 377 vessels were in the 85,000 DWT or larger range, with 331 larger than 100,000 DWT. As can be seen from Table P-20, the majority of the dry bulk carriers over 80,000 DWT in the world fleet are combined carriers in oil. An indication of the future world fleet for transporting Baltimore's bulk commodities is given in Table P-21, "Dry Bulk Carriers on Order in World's Shipyards." It is interesting to note that excluding combined carriers, very little tonnage is on order in the 80-100,000 DWT and 150,000 + DWT class. The 100-150,000 DWT class is popular in all three types of dry bulk carriers.

TABLE P-18

WORLD DRY BULK CARRIERS

1958-1976
(As of Dec 31)

DWT GROUP	1958	1960	1962	1964	1966	1968	1970	1972	1974	1976
Under 10,000	563	614	730	736	708	707	690	733	749	761
10-20,000	237	420	572	615	640	703	758	820	848	924
20-30,000	42	107	213	322	410	558	679	871	1044	1159
30-40,000	16	26	44	87	191	245	272	363	457	558
40-50,000	6	9	17	26	49	121	159	172	194	220
50-60,000	1	6	11	26	67	129	160	185	225	259
60-80,000	3	3	6	10	34	98	136	169	227	285
80-100,000				1	4	40	56	64	67	73
100-125,000						7	28	72	109	147
125-150,000					1	1	9	27	49	67
150-200,000							7	49	75	86
200,000 +								14	31	31
Total	868	1,185	1,592	1,823	2,104	2,609	2,954	3,537	4,075	4,570

Source: U.S. Department of Commerce, Maritime Administration

TABLE P-19

WORLD DRY BULK FLEET DISTRIBUTION (1)

By Year of Build

VESSEL DWT GROUP (thousands)	1955 & earlier		1956-60		1961-65		1966-70		1971-75		1976		TOTAL	
	No.	%DWT	No.	%DWT	No.	%DWT	No.	%DWT	No.	%DWT	No.	%DWT	No.	%DWT
10-20	209	52.4	201	46.6	168	15.5	305	10.7	192	4.0	55	6.9	1130	10.8
20-30	100	41.9	77	26.1	215	30.2	337	18.0	430	14.9	87	17.3	1246	19.0
30-40	6	3.3	21	10.5	117	23.0	117	8.9	233	10.7	51	13.3	545	11.5
40-60	—	—	14	10.0	81	23.1	219	22.8	129	8.7	41	15.8	484	14.6
60-80	2	2.4	7	6.8	12	4.6	119	17.9	109	10.0	28	14.7	277	11.7
80-100	—	—	—	—	5	2.4	48	9.2	19	2.2	1	0.7	73	3.9
100-150	—	—	—	—	2	1.2	42	10.2	147	23.7	25	23.6	216	15.6
150 +	—	—	—	—	—	—	7	2.3	104	25.8	6	7.7	117	12.9
Totals	317	100.0	320	100.0	600	100.0	1194	100.0	1363	100.0	294	100.0	4088	100.0

(1) Includes combination carriers

Source: The Bulk Carrier Register, 1977

TABLE P-20

WORLD DRY BULK CARRIER FLEET

as of Jan 1, 1977
(DWT in thousands)

VESSEL DWT	BULK			ORE			COMBINED CARRIERS IN OIL			TOTALS		
CLASS	NUMBER	DWT	DWT%	NUMBER	DWT	DWT%	NUMBER	DWT	DWT%	NUMBER	DWT	DWT%
10-20,000	1037	16,342.9	15.3	85	1,360.4	11.9	8	114.6	0.3	1130	17,817.9	10.8
20-30,000	1171	29,420.7	27.5	62	1,497.7	13.1	13	318.3	0.7	1246	31,236.7	19.0
30-40,000	518	17,854.4	16.7	21	721.6	6.3	6	204.5	0.5	545	18,780.5	11.5
40-60,000	402	19,720.6	18.5	45	2,351.4	20.5	37	1,936.2	4.2	484	24,008.2	14.6
60-80,000	188	12,770.1	12.0	17	1,212.6	10.6	72	5,199.5	11.3	277	19,182.2	11.7
80-100,000	12	1,005.5	0.9	5	427.7	3.7	56	5,013.9	10.9	73	6,447.1	3.9
100-150,000	78	9,260.9	8.7	23	2,745.9	24.0	115	13,583.0	29.5	216	25,589.8	15.6
150,000 & over	3	468.9	0.4	7	1,131.1	9.9	107	19,605.8	42.6	117	21,205.8	12.9
Totals	3409	106,844.0	100.0	265	11,448.4	100.0	414	45,975.8	100.0	4088	164,268.2	100.0

Source: The Bulk Carrier Register, 1977

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TABLE P-21

DRY BULK CARRIERS ON ORDER IN WORLD'S SHIPYARDS

(as of April 1, 1977)

VESSEL DWT	BULK			ORE			COMBINED CARRIERS IN OIL			TOTALS		
CLASS	NUMBER	DWT	% TOTAL DWT	NUMBER	DWT	% TOTAL DWT	NUMBER	DWT	% TOTAL DWT	NUMBER	DWT	% TOTAL DWT
2-20,000	157	1,945,594	9.1	3	33,800	2.4	1	15,000	0.3	161	1,994,394	7.0
20-29,999	183	4,193,330	19.6	-	—	-	-	—	-	183	4,193,330	14.7
30,39,999	155	5,383,623	25.2	-	—	-	-	—	-	155	5,383,623	18.9
40-49,999	31	1,340,732	6.3	3	132,000	9.3	-	—	-	34	1,472,732	5.2
50-59,999	32	1,810,322	8.5	3	165,000	11.7	-	—		35	1,975,322	6.9
60-69,999	39	2,432,879	11.4	1	62,300	4.4	9	572,760	10.2	47	3,067,939	10.8
70-79,999	26	1,889,577	8.8	-	—	-	-	—	-	26	1,889,577	6.6
80-89,999	6	483,600	2.2	-	—	-	4	330,000	5.8	10	813,600	2.9
90-99,999	-	—	-	-	—	-	3	296,400	5.2	3	296,400	1.1
100-149,999	16	1,902,750	8.9	7	851,000	60.3	26	3,251,601	57.3	49	6,005,351	21.1
150,000 & over	-	—	-	1	167,500	11.9	6	1,204,500	21.2	7	1,372,000	4.8
Totals	645	21,382,407	100.0	18	1,411,600	100.0	49	5,670,261	100.0	712	28,464,268	100.0

Source: Derived from data in Marine Engineering/Log

51. As Table P-22 shows, the average DWT for the world tanker fleet has increased even more sharply than dry bulk carriers, going from 27,100 in 1965 to 68,000 in 1975, an increase of 150 percent. Tables P-23 and P-24 show existing fleet and scheduled deliveries for the world and United States tanker fleets, respectively. Tanker sizes far exceed those of dry bulk carriers. Over 70 percent of the world tanker carrying capacity is in vessels over 100,000 DWT. Although vessels in the United States tanker fleet are somewhat smaller than the world fleet, over 90 percent of the United States flag tonnage on order is in the 100,000+ DWT class.

FLEET SIZE PROJECTIONS

52. By analyzing data on the existing bulk carrier and tanker fleet composition, historic trends in ship characteristics, vessels presently under construction, trends in world shipping, announced plans of the major bulk cargo interests in Baltimore, and other factors influencing vessel size, forecasts can be made as to the composition of the vessel fleets expected to serve Baltimore over the 50-year economic life of the proposed project. The rapid increase in recent years in the average size of vessels used in Baltimore's bulk trades is expected to continue into the future, regardless of channel depths at Baltimore. If the proposed channel improvements are constructed, a greater percentage of the commerce will be transported in large bulk carriers. The future fleet for the dry bulk trades is projected to range from less than 20,000 DWT to greater than 150,000 DWT. The future tanker fleet at Baltimore will range from 20-90,000 DWT. Existing and projected fleets for each commodity are discussed below.

IRON ORE

53. During 1975 and 1976, 412 vessels arrived at Baltimore carrying 21,460,276 tons of iron ore. The average ship size was 55,000 DWT carrying an average load of 52,100 short tons. Analysis of the individual shipments reveals that in almost every case, the vessels were loaded to their maximum capacity, or capacity as constrained by channel depths at Baltimore or the loading port. As can be seen from Table P-25, the composition of the fleet carrying iron ore to Baltimore varies among each of the major supply countries. However, the most popular class of ship in each trade is the "Panamax" size vessels ranging from 50,000-60,000 DWT, accounting for over 40 percent of the import tonnage. Over two-thirds of the vessels during this period were greater than 50,000 DWT, which, with corresponding maximum drafts of 40 feet and greater, required some degree of light-loading. The largest ship delivering iron ore to Baltimore was the 160,186 DWT "Yemanja," partially laden with just over 100,000 short tons of Brazilian ore.

TABLE P-22

WORLD TANKER FLEET

TRENDS IN AVERAGE SIZE

Year	Number	DWT (1,000)	Average DWT
1965	3436	93,172	27,100
1966	3524	102,909	29,200
1967	3613	112,366	31,100
1968	3775	128,128	33,900
1969	3893	146,029	37,500
1970	4002	167,940	42,000
1971	4207	193,891	46,100
1972	4342	221,204	50,900
1973	4572	256,822	56,200
1974	4892	302,277	61,800
1975	5092	347,144	68,200

Source: Sun Oil Company

TABLE P-23

WORLD TANKER FLEET

as of April 1, 1977

(000 DWT)

Vessel DWT Class	Existing Fleet No.	Existing Fleet DWT	Existing Fleet %DWT	Scheduled Deliveries No.	Scheduled Deliveries DWT	Scheduled Deliveries %DWT
10-20,000	489	7,791	2.5	28	403	1.2
20-30,000	442	10,400	3.3	11	274	0.8
30-50,000	551	20,703	6.7	75	2,594	7.6
50-70,000	299	17,224	5.5	26	1,458	4.3
70-100,000	391	32,904	10.6	39	3,700	10.9
100-125,000	131	14,817	4.8	14	1,522	4.5
125-275,000	179	25,164	8.1	47	6,872	20.2
175-225,000	150	31,875	10.3	2	399	1.2
225-300,000	467	119,086	38.3	21	5,424	15.8
300,000 +	85	30,907	9.9	30	11,412	33.5
TOTALS	3184	310,871	100.0	293	34,058	100.0

Note: Excludes ships under 10,000 DWT

Source: H.P. Drewry Ltd., London and Marine Engineering/ Log, June 1977

TABLE P-24

UNITED STATES TANKER FLEET

as of April 1, 1977

Vessel DWT Class	Existing Fleet No.	Existing Fleet DWT	Existing Fleet %DWT	Scheduled Deliveries No.	Scheduled Deliveries DWT	Scheduled Deliveries %DWT
2-20,000	19	344,117	3.7	1	10,100	0.2
20-30,000	67	1,796,005	19.4	2	70,000	1.5
30-40,000	16	2,320,779	25.1	-	--	--
40-50,000	6	729,512	7.9	-	--	--
50-60,000	6	312,648	3.4	-	--	--
60-70,000	10	389,044	4.2	-	--	--
70-80,000	6	719,710	7.8	-	--	--
80-90,000	7	487,300	5.3	-	--	--
90-100,000	6	642,600	6.9	4	367,400	8.0
100-200,000	7	725,870	7.8	12	1,997,600	43.4
200,000 +	3	792,219	8.6	7	2,156,310	46.9
TOTAL	212	9,259,804	100.0	26	4,601,410	100.0

Source: Derived from data in Marine Engineering/Log, June 1977

TABLE P-25
BALTIMORE HARBOR IRON ORE IMPORTS, 1975-76
by vessel size

DWT Group (thousands)	Canada		Brazil		Liberia		Venezuela		Others		TOTALS		
	Trips	% Tons	Trips	% Tons	Trips	% Tons	Trips	% Tons	Trips	% Tons	Trips	Tons	% Tons
Under 30	-	-	24	8.6	-	-	1	0.6	12	13.7	37	888,563	4.1
30-40	3	1.4	14	7.2	1	1.5	4	3.7	5	11.4	27	982,586	4.6
40-50	16	13.4	15	10.0	4	8.1	31	35.2	3	8.1	69	3,286,613	15.3
50-60	48	45.1	56	40.8	18	42.7	35	45.5	8	26.2	165	8,896,035	41.5
60-70	19	19.6	13	10.7	11	28.1	10	13.4	10	36.3	63	3,758,686	17.5
70-80	15	16.7	10	9.0	7	19.6	3	4.6	1	4.3	36	2,395,639	11.2
80-90	2	2.4	3	2.9	-	—	-	-	-	-	5	361,681	1.7
90-100	1	1.4	-	-	-	—	-	-	-	-	1	87,294	0.4
100-150	-	—	7	8.1	-	—	-	-	-	-	7	599,135	2.7
150 +	-	—	2	2.7	-	—	-	-	-	-	2	204,044	1.0
TOTALS	140	100.0	144	100.0	41	100.0	84	100.0	39	100.0	412	21,460,276	100.0
% tonnage		28.3		34.7		10.9		18.7		7.4		100.0	

54. Iron ore is easily the most important dry bulk commodity in terms of tonnage to be transported by the growing world bulk and combined carrier fleets. The size of vessels employed in the iron ore trades has been progressively increasing since the 1960's. In 1975, vessels over 50,000 DWT accounted for over two-thirds of the total world trade, with nearly one-third of the total trade moving in vessels greater than 100,000 DWT. Because shipping costs represent such a high proportion of the total delivered price of iron ore, the trend towards the larger, more economical carriers, in the iron ore trade is expected to continue. For any trade, the size of vessels employed is determined by transport distance, amount of tonnage moving on a given route, water depths at both loading and discharge ports, adequacy of loading and unloading facilities, and the availability of various types and sizes of vessels for this trade. Depending on the combination of these factors, the most efficient vessel on any given trade is not always the largest available, as economies of scale begin to diminish once a certain size has been reached.

55. Currently, with draft restrictions at Baltimore Harbor, the preferred vessel size is 50,000-60,000 DWT, the largest size ship that can presently fully load at Baltimore over the 42-foot channels, allowing only a 2-foot keel clearance. With a 50-foot channel at Baltimore, the primary influencing factor in the selection of ship sizes to import iron ore would be the draft restrictions at Baltimore's major foreign supply ports. Seven Islands, Canada, and Tubarao, Brazil, with draft restrictions of 60 and 86-1/2 feet, respectively, present no problems in loading the largest vessels in the ore trade. The constraint in imports from these countries would remain the controlling depth at Baltimore Harbor, 50 feet under improved conditions, which would allow fully loaded vessels up to 90,000 DWT.

56. On the other hand, Buchanan, Liberia, and Palua, Venezuela, Baltimore's other primary supply ports, do restrict the draft to which a vessel can be loaded. Buchanan, with water depths of 44 feet, restricts vessels to a salt water draft of 42 feet, corresponding to a fully loaded 50,000 DWT bulk carrier. The channel at Buchanan has a rock bottom and deepening is, therefore, felt to be too costly. A maximum of only 3 feet additional draft will be gained in this trade by deepening Baltimore Harbor, and therefore, is expected to affect the future fleet distribution for Liberian iron ore very little. The loading terminal at Palua, Venezuela, located up the Orinoco River, can receive ships up to 42 foot draft, or 60,000 DWT. The controlling depth of the river varies between 33 and 43 feet according to the season. The larger ships during the low water season (December-May) on the Orinoco are light-loading due to draft restrictions but at high water (June-November) can fully load to 42 feet. Aside from tidal fluctuations, navigation on the river is also inhibited by the problem of rapid silting. Since expropriation of the iron ore mines by the Venezuelan government, there have been increasing problems in keeping the river dredged to its original depth. Due to the high volume of maintenance dredging currently required, it is felt that further deepening beyond 43 feet high water would be cost prohibitive. Because of uncertainties concerning future river depths due to the silting problems and the fact that depths greater than Baltimore Harbor's existing 42 feet are available only part of the year during high water (43 feet maximum), no benefits in transporting iron ore from Venezuela are expected to accrue from deepening Baltimore Harbor beyond 42 feet. Therefore, the size distribution for the fleet from Venezuela was not projected.

57. Future fleet distributions were projected for iron ore imports from Canada, Brazil, and Liberia, and are presented in Table P-26. Changes in the distributions on a 42-foot and a 50-foot channel are a result of increased use of larger vessels on a 50-foot channel

TABLE P-26

BALTIMORE HARBOR
FUTURE FLEET DISTRIBUTION - IRON ORE IMPORTS
(by percent of commerce)

Vessel DWT Group	Canada Existing (1) 42 ft.	Canada Future 42 ft.	Canada Future 50 ft.	Liberia Existing (1) 42 ft.	Liberia Future 42 ft.	Liberia Future 50 ft.	Brazil Existing (1) 42 ft.	Brazil Future 42 ft.	Brazil Future 50 ft.
Under 30,000	---	---	---	---	---	---	8.6	---	---
30-40,000	1.4	---	---	1.5	---	---	7.2	5	---
40-60,000	58.5	40	15	50.8	35	25	50.8	40	15
60-80,000	36.3	50	55	47.7	60	65	19.7	30	35
80-100,000	3.8	5	10	---	5	10	2.9	5	10
100-150,000	---	5	20	---	---	---	8.1	15	30
150,000+	---	---	---	---	---	---	2.7	5	10
TOTAL	100.0	100	100	100.0	100	100	100.0	100	100

(1) Based on 1975-1976 imports

plus being able to load these vessels more fully. Considered in making these projections were the announced intentions and opinions of iron ore importers and existing and anticipated availability of various size vessels in the world fleet for this trade.

COAL

58. Vessels employed in exporting coal from Baltimore include colliers, general bulk, and combination carriers ranging from under 10,000 DWT to greater than 150,000 DWT. The shipment of record is 84,739 tons of coal, exported in the 123,450 DWT carrier, "Sealane" in October 1979. Table P-27 presents the existing (1979-80) distribution of coal exports by vessel size for the major areas of trade for Baltimore. It should be noted that these fleet size distributions vary considerably for each area of the world. In the Japanese trade, the majority of the commerce is transported by the "Panamax" size vessels, those ships in the 50-80,000 DWT range. These ships, specially designed to allow transit of the Panama Canal with beam widths of a maximum of 106 feet, have fully-laden drafts up to 47 feet. Ships in the South American trade are generally smaller, averaging only 48,000 DWT. Ships carrying coal to Europe and other countries in the world ranged from 5,000 to 130,000 DWT, with nearly 80 percent of the commerce moving in vessels of 60,000 DWT or greater.

59. Waterborne shipping of coal has in recent years experienced dramatic growth in average vessel size carrying coal. The share of world seaborne trade transported by bulk carriers over 50,000 DWT grew from 4 percent in 1965 to nearly 50 percent in 1974. Similarly, the proportion of Baltimore Harbor coal exports in vessels over 50,000 DWT has risen from about 10 percent in 1966 to greater than 90 percent in 1980. The main factors in determining optimum ship size on any trade route are the shipping distance and limitations imposed by port facilities on both the loading and discharging ends. As noted earlier, the fleet size distribution for Baltimore coal to various areas of the world and different countries within these areas shows significant variations. Table P-28 shows characteristics of 1979-10/1980 coal shipments to each country. Analysis of individual shipments to each country reveals that only coal destined for Japan, United Kingdom, France, the Netherlands, and Turkey regularly leave Baltimore in vessels carrying full loads of cargo. In some cases, channel depths at the Port of Baltimore restrict a ship from fully loading. In other trades, depth restrictions at the unloading terminals are the limiting factor. Also, it is common practice in many metallurgical coal trades for vessels to partially load at Baltimore, then top-out at Hampton Roads where they can load to 50 feet with a favorable tide. Characteristics and fleet size projections for each of the three major geographical areas of destination for Baltimore coal are discussed below.

TABLE P-27
BALTIMORE HARBOR COAL EXPORTS 1979-80 1/

VESSEL DWT	JAPAN Trips	JAPAN Tons	JAPAN %	SOUTH AMERICA Trips	SOUTH AMERICA Tons	SOUTH AMERICA %	EUROPE & OTHER Trips	EUROPE & OTHER Tons	EUROPE & OTHER %	TOTAL Trips	TOTAL Tons	TOTAL %
Under 20,000	0	0	0.0	2	33,984	3.0	10	161,555	1.1	12	195,539	0.8
20-30,000	0	0	0.0	1	20,909	1.8	7	180,029	1.3	8	200,929	0.8
30-40,000	1	31,999	0.4	5	168,171	14.7	9	337,724	2.4	15	537,894	2.2
40-50,000	3	134,941	1.6	3	129,744	11.4	12	546,969	3.8	18	811,654	3.4
50-60,000	17	951,974	11.0	10	524,707	45.9	34	1,826,184	12.7	61	3,302,865	13.7
60-70,000	47	3,101,670	35.9	3	193,134	16.9	46	2,896,527	20.2	96	6,191,331	25.6
70-80,000	34	2,575,012	29.8	1	71,776	6.3	49	3,654,665	25.4	84	6,301,453	26.1
80-100,000	5	418,719	4.9	0	0	0.0	16	1,410,180	9.8	21	1,828,899	7.6
100,000+	12	1,418,708	16.4	0	0	0.0	31	3,352	23.3	43	4,771,406	19.8
TOTALS	119	8,633,023	100.0	25	1,142,416	100.0	214	14,366,531	100.0	358	24,141,970	100.0
% COMMERCE		35.8%			4.7%			59.5%			100%	

1/ Based on Maryland Port Administration data from 1979 through October 1980.

TABLE P-28

BALTIMORE HARBOR COAL EXPORTS
SHIPMENT CHARACTERISTICS, 1979-80

Country	Trips	Tons	Average Tons	Average DWT
Japan	120	7,136,850	59,474	71,942
France	37	1,969,646	53,234	60,538
Belgium	35	2,252,294	64,351	91,651
Netherlands	26	1,501,507	57,750	68,558
Scandanavia	20	1,054,155	52,708	65,233
United Kingdom	18	751,468	41,748	51,516
Turkey	17	749,070	44,063	47,894
W. Germany	14	737,288	52,663	79,349
Romania	12	567,473	47,289	63,389
Brazil	12	307,668	25,639	47,670
Argentina	10	286,990	28,699	49,598
Yugoslavia	9	636,689	70,743	99,442
Italy	8	295,731	36,966	56,255
Egypt	7	309,432	44,205	55,368
Others	13	507,435	41,895	50,801
TOTAL	358	19,063,696	53,354	67,715

South America

60. Coal exports from Baltimore to South American countries during 1979-1980 averaged only 26,000 tons per shipment. Although some larger ships up to 72,000 DWT are used in this trade, few were loaded to their capacity as restricted by channel depths. The average vessel size in this trade was only 48,000 DWT. Three factors contribute to the use of small ships and small individual shipments. They are (1) limited volume, (2) relatively short distance to South America, and (3) South American coal terminals presently are not able to handle larger bulk carriers. The maximum depth available at either Rio de Janeiro, Brazil, or San Nicholas, Argentina, the major South American ports receiving coal through Baltimore, is 39 feet, corresponding to a fully-loaded 40,000 DWT ship. The future fleet distribution for South American coal is projected below in Table P-29. It is anticipated that primarily vessels under 80,000 DWT will continue to be utilized in shipments to South America. The channel depth at Baltimore is not expected to affect this distribution.

TABLE P-29

BALTIMORE HARBOR FLEET DISTRIBUTION
COAL TO SOUTH AMERICA
(Percent Commerce by DWT Group)

Vessel DWT	Existing (1)	Future 42'	Future 50'
Under 30,000	4.8	5	5
30-40,000	14.7	10	10
40-60,000	57.3	60	60
60,000+	23.2	25	25
TOTAL	100.0	100	100

(1) 1979-1980 shipments

Although most of the commerce is projected to move in vessels greater than 40,000 DWT, it is unlikely that these ships will load to even the existing Baltimore Harbor channel capacity. Therefore, no benefits will accrue to South American coal exports.

Europe

61. Analysis of 1979 and 1980 Baltimore Harbor coal exports to European countries reveals that 165 of the 213 shipments, representing 83 percent of the commerce, left Baltimore in vessels either fully loaded, or loaded as fully as channel depths allow. Much of the remaining 17 percent (about 1 million tons) is accounted for by vessels topping-off in Norfolk. Many European countries importing coal need a blend of different grades of coal for steel making purposes. It is common practice for them to charter a vessel to load only a few holds at Baltimore where it picks up medium-volatile "Northern" coal, then top-out at Hampton Roads with low-volatile "Southern" coal. Even the larger bulk carriers engaged in this practice are not loading to the 42-foot available depth at Baltimore, and there is currently no advantage to a deeper channel at Baltimore for this type of trade. Although this practice is expected to continue, the increasing size of vessels forecast in the coal track will mean that nearly all will require a deeper channel in the future.

62. The future fleet for the European coal trade is projected in Table P-30. "Panamax" size ships from 50-80,000 DWT are expected to continue to dominate in the transatlantic coal trades in the near future. As port facilities at the discharging end continue to be improved, the use of 100-120,000 DWT bulk carriers and OBO's (ore/bulk/oil) will gradually be extended. All major Western European coal importers have deep water to accommodate 100,000 DWT carriers either currently available or in planning stages. With deepening of Baltimore Harbor to 50 feet, a significant portion of the coal exports are expected to move in vessels over 100,000 DWT.

TABLE P-30

BALTIMORE HARBOR FLEET DISTRIBUTION
COAL TO EUROPE
(Percent Commerce by DWT Group)

Vessel DWT	Existing (1)	Future 42'	Future 50'
Under 30,000	2.4	0	0
30-40,000	2.4	0	0
40-60,000	16.5	15	10
60-80,000	45.6	45	30
80-100,000	9.8	10	15
100-150,000	23.3	25	35
150,000 +	—	5	10
TOTAL	100.0	100	100

(1) 1979-1980 shipments.

Japan

63. In the Japanese coal trade, the overriding factor influencing ship size is the Panama Canal, with constraints of 40 feet maximum draft and 106 feet beam width. This limits full-loaded ship size to about 50,000 DWT, although larger "Panamax" ships up to 80,000 DWT can transit the canal light-loaded. Vessels greater than 80,000 DWT must be routed around Africa due to the beam restrictions of the Canal. The cost analysis presented below in Table P-31 indicates that the transportation cost per cargo ton of shipping via the Canal route with "Panamax" ships is less than the cost of going around Africa with the larger carriers.

TABLE P-31

COAL EXPORTS TO JAPAN
PANAMA CANAL VS. AFRICA
(shipping cost/ton)

Vessel DWT	42 ft. at Baltimore Canal	42 ft. at Baltimore Africa	50 ft. at Baltimore Canal	50 ft. at Baltimore Africa
50,000	$27.20	$32.81	$26.24	$31.64
60,000	26.52	32.56	25.58	29.30
70,000	26.61	32.32	25.68	27.30
80,000 (1)	---	38.62	---	30.60
100,000 (1)	---	38.14	---	29.48
120,000 (1)	---	38.57	---	29.80
150,000 (1)	---	41.34	---	31.71

(1) Beam too wide for Panama Canal

64. Although with a 50-foot channel at Baltimore the cost difference per ton narrows, it is still significant. Going around the tip of Africa adds more than 10,000 nautical miles to the round-trip distance, an increase of about 50 percent over the canal route. The increased capacity of larger vessels going around Africa, being restricted by channel depths at Baltimore, does not offset the increased voyage costs of going this route. Because there is no apparent cost advantage to routing vessels around the Cape of Good Hope over taking them through the Panama Canal, it is likely that "Panamax" size ships will continue to dominate in Baltimore's coal trade to Japan. Table P-32 presents the percentage distribution of coal to be transported to Japan in each vessel DWT class.

TABLE P-32

BALTIMORE HARBOR FLEET DISTRIBUTION
COAL TO JAPAN
(Percent Commerce by DWT Group)

Vessel		Future	
DWT	Existing (1)	42'	50'
Under 30,000	--	--	--
30-40,000	0.4	--	--
40-60,000	12.6	10	5
60-80,000	65.7	65	60
80-100,000 (2)	4.9	5	5
100-150,000 (2)	16.4	20	25
150,000 + (2)	--	--	5
TOTAL	100.0	100	100

(1) 1979-1980 shipments
(2) Cannot transit Panama Canal

GRAIN

65. Baltimore Harbor's grain trade is characterized by widespread points of destination and relatively small volume individual shipments. A total of 393 shipments were recorded in 1975 and 1976 carrying 10,590,766 short tons of cargo. The average tonnage per shipment was 26,950 tons, with the average ship size being 32,000 DWT. Table P-33 shows the fleet distribution in 1975 and 1976 for the major areas of the world. Due to limitations on channel depths and unloading facilities in many countries, larger vessels are employed only in trade with certain countries within Europe and Asia. Vessel sizes ranged from under 10,000 DWT to greater than 120,000 DWT. The largest vessel loading grain at Baltimore was the 125,102 DWT bulk carrier, "D. C. Coleman," carrying 64,914 tons to Poland.

TABLE P-33

BALTIMORE HARBOR GRAIN EXPORTS, 1975-1976
by vessel size

Vessel	W. Europe		E. Europe		Mid-East		Asia		Other		Total		
DWT Group	Trips	% Tonnage	Trips	% Tonnage	Trips	% Tonnage	Trips	% Tonnage	Trips	% Tonnage	Trips	Tons	Tonnage
Under 20,000	44	12.0	15	6.9	4	6.0	10	8.0	11	39.9	84	1,138,632	10.8
20-30,000	70	30.8	19	18.0	17	43.3	19	27.1	7	37.2	132	3,016,148	28.5
30-40,000	36	20.6	29	34.0	12	38.0	9	15.4	1	7.0	87	2,603,996	24.6
40-50,000	17	12.1	13	17.1	5	12.7	4	12.3	-	-	39	1,379,789	13.0
50-60,000	13	10.9	10	14.8	-	-	1	2.7	-	-	24	1,023,170	9.7
60-70,000	9	9.0	1	1.0	-	-	1	4.5	-	-	11	564,893	5.3
70-80,000	3	3.1	1	1.8	-	-	1	4.8	-	-	5	272,336	2.6
80-100,000	2	1.5	1	1.6	-	-	4	21.2	-	-	7	353,325	3.3
100,000 +	-	-	2	4.8	-	-	1	4.0	1	15.9	4	238,427	2.2
TOTALS	194	100.0	91	100.0	38	100.0	50	100.0	20	100.0	393	10,590,766	100.0

66. As grain shipments from the United States have increased in recent years, there has evolved a trend towards medium and large tonnage vessels to move the grain. Vessels of up to 100,000 DWT and greater are being increasingly employed. However, there is still a very wide range of bulk carrier sizes seeking employment. Although the average ship size in the grain trade has increased over the years, there seems to be a limitation on the further use of vessels larger than 40,000 DWT. Vessels greater than 40,000 DWT have failed to increase their share of the grain market since 1969, due mainly to restrictions on using large bulk carriers within importing areas.

67. Careful analysis of grain shipments from Baltimore Harbor reveals that only on the more established and high volume trades are the larger carriers employed. It is only at those major importing countries that it is economical to invest in sophisticated unloading techniques and storage facilities, and to dredge channels deep enough to accommodate the larger bulk carriers. Table P-34 shows the average vessel size and shipment size in 1975-1976 to the countries in each of the general geographic areas of the world receiving grain from Baltimore Harbor. The countries using the largest average vessels were to the Netherlands, Belgium, Poland, India, and Pakistan. A significant number of vessels greater than 40,000 DWT were also received at England, Portugal, West Germany, Spain, and U.S.S.R. As can be seen, the utilization of larger vessels is concentrated mainly in the trades with Western Europe, and to a lesser extent Eastern Europe, where adequate port facilities exist. It is expected that continued upgrading of port facilities and deepening of channels will continue in the future at ports in these countries as import volumes increase. It is likely that an increasing share of the grain transported to these countries will be carried in medium and large tonnage vessels.

68. At the other countries importing grain, particularly at discharge ports in the Third World, the irregular trade patterns have hindered port development, grain imports being primarily residual flows and virtually unpredictable. Because it is not economically feasible for these countries to improve their port facilities for grain imports, many of the ports use general discharge berths with time-consuming unloading techniques and limited storage capacity, making large bulk carrier employment uneconomical if not impossible. In addition, depth restrictions at these countries, often under 30 feet, discourages the use of larger vessels. Because of the limited and sporadic volumes to these minor importing countries, it is expected that the majority of their future grain imports will continue to be transported in vessels under 30,000 DWT.

69. Due to the scarcity of grain discharging terminals in the world capable of accommodating large bulk carriers drawing more than 40 feet, no appreciable transportation benefits would result in the grain trade from deepening the main shipping channel in Baltimore beyond the existing 42 feet. The grain exporter located on the main channel, with restricting depth of only 37 feet alongside its pier, has no immediate plans to deepen to even the existing channel depth. However, the grain exporter on the Northwest Branch-West Channel, where channel depths are only 35 feet, has indicated desire to deepen its facilities to 39 or 40 feet in conjunction with the Federal project, currently authorized to 40 feet. Therefore, benefits in the grain trade were considered for only this exporter. The future distribution of commerce by vessel size projected for each major geographical area is presented in Table P-35 for channel depths of 35 and 40 feet.

TABLE P-34

BALTIMORE HARBOR GRAIN EXPORTS

1975-1976

	Trips	Tons	Average Tons	Average DWT	Vessels Over 40,000 DWT
West Europe					
England	15	479,673	31,978	32,893	4
France	28	510,964	18,248	19,443	0
Italy	22	498,559	22,661	24,781	1
Netherlands	17	736,984	43,352	51,564	13
Portugal	21	579,389	27,590	33,081	8
West Germany	21	722,265	34,394	37,472	7
Spain	56	1,490,065	26,608	29,651	7
Belgium	66	274,654	45,776	50,812	4
Other	9	124,801	13,867	19,630	0
Total	195	5,417,354	27,781	30,965	44
East Europe					
USSR	60	1,699,892	28,331	31,677	14
Poland	22	818,554	37,207	52,189	13
Other	9	206,709	22,968	26,773	1
Total	91	2,725,155	29,947	36,150	28
Mid-East					
Egypt	20	536,824	26,841	33,615	5
Israel	7	201,425	28,775	29,500	0
Other	11	234,040	21,276	23,558	0
Total	38	972,289	25,586	29,946	5
Far East					
Japan	14	118,915	8,493	22,323	0
Other	9	172,468	19,163	27,745	1
Total	23	291,383	12,669	22,880	1
India/Pakistan	27	789,803	29,252	44,750	11
Africa & S. America	19	332,021	17,475	19,823	0
TOTAL	393	10,590,766	26,900	32,002	89

TABLE P-35

BALTIMORE HARBOR
FUTURE FLEET DISTRIBUTION - GRAIN EXPORTS
(by percent of commerce)

Vessel DWT Group	Europe Existing (1)	Europe Future 35 ft.	Europe Future 40 ft.	Asia Existing (1)	Asia Future 35 ft.	Asia Future 40 ft.	Mid-East & Other Existing (1)	Mid-East & Other Future 35 ft.	Mid-East & Other Future 50 ft.
Under 30,000	36.8	30	25	35.1	20	15	60.1	50	50
30-40,000	25.1	20	15	15.4	20	15	30.4	30	30
40-60,000	26.0	25	20	15.0	20	20	9.5	20	20
60-80,000	9.0	15	20	9.3	15	20	----	----	----
80-100,000	1.5	5	10	21.2	20	20	----	----	----
100,000+	1.6	5	10	4.0	5	10	----	----	----
TOTAL	100.0	100	100	100.0	100	100	100.0	100	100

(1) Total Harbor, 1975-1976 shipments.

PETROLEUM

70. Table P-36 presents the size distribution for vessels bringing petroleum products into Baltimore from both foreign and coastwide sources in 1975 and 1976. Vessels ranged in size up to 76,863 DWT, with fully-loaded drafts up to 42 feet. The record cargo during this period was 77,139 short tons, received in the 68,968 DWT "Exxon Houston." The U.S. flag ships engaged in coastwise trade with the U.S. Gulf carrying the "clean" petroleum products to the petroleum terminal on the Northwest Branch are generally larger than those ships carrying the heavy residual fuel from foreign sources. Most of those larger ships above 50,000 DWT had to enter the harbor less than fully loaded. Because of depth restrictions at the various petroleum terminals throughout the harbor and limited volumes of petroleum, vessels less than 40,000 DWT are the most popular size, accounting for over three-quarters of the vessel trips during 1975 and 1976.

71. Although significant volumes of petroleum are received at terminals throughout the harbor, only the major petroleum receiver in the Northwest Branch of the harbor has indicated a need for deeper channels to accommodate his present and anticipated future vessel fleet. In the past, this terminal operator has received both "dirty" and "clean" products by ship, but has recently switched all of its clean products over to pipeline. Therefore, the future fleet for the heavy residual fuel oils only is projected. It is anticipated that they would use tankers up to 90,000 DWT if adequate channel depths were available in Baltimore. The major supply points for residual fuel, located in the Caribbean area, have water depths capable of accommodating vessels greater than 200,000 DWT. However, very little residual would be imported in ships greater than 90,000 DWT, as there are very few heavy fuel oil tankers of 100,000 DWT in the world. Table P-37 presents the future fleet projection for residual fuel oil at the Northwest Branch terminal.

SUGAR

72. In 1975 and 1976, over one-fourth of the vessels, carrying nearly 50 percent of the sugar received at Baltimore, were larger than 20,000 DWT. These ships, with a fully laden draft in excess of 32 feet, had to light-load in order to safely arrive at the sugar pier. The largest ship received was a 37,000 DWT vessel, with a fully-loaded draft (salt water) of 37 feet, 4 inches, carrying 30,520 tons of sugar from the Philippines. Table P-38 presents the sugar fleet distribution by vessel DWT class for 1975 and 1976.

TABLE P-36

BALTIMORE HARBOR
PETROLEUM IMPORTS, 1975 & 1976

DWT	FOREIGN		TOTAL HARBOR COASTWISE		TOTAL		FOREIGN		NW BRANCH COASTWISE		TOTAL	
GROUP	TRIPS	% TONNAGE	TRIPS	% TONNAGE	TRIPS	% TONNAGE	TRIPS	% TONNAGE	TRIPS	% TONNAGE	TRIPS	%TONNAGE
Under 30,000	105	36.0	197	23.6	302	28.4	7	9.2	84	21.4	91	17.6
30-35,000	57	25.0	27	6.4	84	13.5	22	31.0	2	1.4	24	10.7
35-40,000	31	17.9	59	15.3	90	16.3	15	24.4	5	2.8	20	9.5
40-45,000	14	8.1	25	9.4	39	8.9	3	6.3	2	1.9	5	3.3
45-50,000	11	8.0	11	5.2	22	6.3	7	15.8	-	-	7	4.9
50-60,000	6	3.7	18	7.1	24	5.7	6	9.6	11	8.4	17	8.8
60-70,000	1	0.5	40	24.0	41	15.0	1	1.4	40	46.7	41	32.5
70,000 & over	1	0.8	18	9.0	19	5.9	1	2.3	18	17.4	19	12.7
TOTAL	226	100.0	395	100.0	621	100.0	62	100.0	162	100.0	224	100.0

TABLE P-37

BALTIMORE HARBOR
FUTURE FLEET DISTRIBUTION - PETROLEUM (1)
(Percent Commerce by DWT Group)

Vessel DWT Group	Existing (2) 39'	Future (3) 39'	Future (3) 42'	Future (3) 49'
Under 30,000	12	10	--	--
30-40,000	22	50	10	10
40-50,000	9	30	10	10
50-60,000	9	10	20	15
60-70,000	35	--	30	25
70-80,000	13	--	30	30
80,000 & over	--	--	--	10
TOTAL	100	100	100	100

(1) Projections for Northwest Branch terminal only
(2) All petroleum products, 1975-1976
(3) Residual fuel only

73. Most bulk sugar shipments in the world are handled in bulks of between 20-35,000 DWT, and terminal developments currently taking place throughout the world are geared to this size tonnage. However, less than 50 percent of the sugar receipts at Baltimore are carried in vessels of this size or greater. Because of the relatively limited volumes of sugar imported and Baltimore's widespread sources of supply, it is anticipated that much of the sugar coming into Baltimore will continue to be carried in vessels in the 20,000 DWT class, regardless of available water depths. However, those ships importing sugar from Baltimore's larger supply countries are likely to increase in size with a deeper channel at Baltimore, reflecting increased transportation efficiency. The projected future fleet for the Baltimore Harbor sugar trade is presented in Table P-39.

TABLE P-38

BALTIMORE HARBOR
SUGAR IMPORTS BY VESSEL SIZE, 1975 & 1976

VESSEL DWT GROUP	TRIPS	1975 TONS	%TONNAGE	TRIPS	1976 TONS	%TONNAGE	TRIPS	1975 & 1976 TONS	%TONNAGE
Under 20,000	35	309,381	65.2	32	275,640	45.5	67	585,021	54.2
20 - 25,000	3	62,351	13.1	4	71,664	11.8	7	134,015	12.4
25 - 30,000	4	59,337	12.5	11	258,314	42.7	15	317,651	29.4
Over 30,000	2	43,284	9.5	-	-	-	2	43,284	4.0
TOTAL	44	474,353	100.0	47	605,618	100.0	91	1,079,951	100.0

TABLE P-39

BALTIMORE HARBOR
FUTURE FLEET DISTRIBUTION - SUGAR
(Percent Commerce by DWT Group)

Vessel DWT Group	Existing (1)	Future 32'	Future 40'
Under 20,000	54.2	35	35
20-25,000	12.4	15	5
25-30,000	29.4	40	30
30-40,000	4.0	10	20
40,000 and over	-	-	10
TOTAL	100.0	100	100

(1) 1975-1976 commerce

TRANSPORTATION COST ANALYSIS

GENERAL

74. To determine the navigation benefits to result from the deepening of the Baltimore Harbor and Channels, it is first necessary to compute the total round-trip costs associated with a vessel movement over each of the major trade routes used for Baltimore commerce. Major countries supplying Baltimore with iron ore are Canada, Venezuela, Liberia and Brazil. For petroleum imports, the major shipper is Venezuela. Representative countries in Baltimore's coal export trade are Japan, Brazil (in the South American trade), and Netherlands (in the European trade). For the grain export trades, voyage costs were calculated for representative countries in West Europe, East Europe, the Mid-East, and Asia. The shipping ports supplying Baltimore with sugar are spread widely throughout the world. To compute transportation costs in this trade, average shipping distances for the South and Central American and the Asian and African supply countries were calculated. In addition to shipping distance, other factors influencing round-trip voyage costs include the type and size of vessel, vessel cruising speed, time spent in port, and various costs incurred by a vessel while in port.

HOURLY OPERATING COSTS

75. Tables P-40 and P-41 present the hourly operating costs for various sizes of bulk carriers and tankers, both at sea and in port. These costs, developed by the Office of the Chief of Engineers (OCE), consist of the amortized investment cost of the vessel, crew wages and allowances, subsistence, stores, supplies and equipment, maintenance and repairs, insurance, profits, taxes and fuel costs. As can be seen from the tables, cost for United States flag vessels are substantially higher than those for foreign flag vessels. This is due to United States registry requirements, which mandate that United States flag ships be constructed in United States shipyards and operated by United States crews, at costs much higher than foreign flag vessels.

TABLE P-40

HOURLY OPERATING COSTS
FOREIGN FLAG DRY BULK VESSELS

(January, 1981 Price Level) 1/

Vessel Deadweight	At Sea	In Port
15,000	$ 734	$ 544
25,000	818	569
35,000	881	612
50,000	986	683
60,000	1,094	736
80,000	1,303	845
100,000	1,486	961
120,000	1,667	1,055
150,000	1,957	1,212

1/ Costs are indexed to January 1981, based on Janury 1979 costs from OCE.

TABLE P-41

HOURLY OPERATING COSTS
U.S. AND FOREIGN FLAG TANKERS

(January, 1981 Price Level) 1/

Vessel	U.S. Flag		Foreign Flag	
Deadweight	At Sea	In Port	At Sea	In Port
20,000	$1,290	$1,079	$771	$548
25,000	1,448	1,112	899	582
37,000	1,494	1,159	878	591
50,000	1,629	1,262	1,064	688
60,000	1,898	1,317	1,116	728
70,000	2,026	1,483	1,159	772
80,000	2,161	1,607	1,237	826
90,000	2,301	1,697	1,283	866
120,000	2,677	1,992	1,497	1,016
150,000	2,996	2,246	1,745	1,158

1/ Costs are indexed to January 1981, based on January 1979 costs from OCE.

COSTS AT SEA

76. Costs at sea in each trade are determined by hourly operating costs at sea, round-trip distance, and average cruising speeds for each size vessel. Round-trip distances were derived from data contained in Distances Between Ports 1965, Department of the Army Oceanograhic Office, and are shown in Table P-42. Average cruising speeds for vessels serving Baltimore Harbor, taken from data provided by Office of the Chief of Engineers, ranged from 14.0 to 15.5 knots for dry bulk vessels and from 16.0 to 16.5 for tankers.

COSTS IN PORT

77. Costs in port are comprised of operating costs for the time spent in port and other charges for various services performed for that vessel in port. Total time in port consists of time spent on loading and unloading of cargo, plus additional time not directly related to cargo handling. Loading and unloading times for each commodity were determined by averaging cargo handling rates for Baltimore and the appropriate foreign ports. Additional time evaluated includes time spent entering and exiting a port, waiting for pilotage, waiting for a berth, docking and undocking, and general port congestion. Due to different levels of port development throughout the world, total time spent in port varies at the different countries with which Baltimore does trade. Estimates for this additional time for each country ranged from 24 to 72 hours per round-trip. For trades that use the Panama Canal, 24 hours per transit, or 48 hours total round-trip was added.

78. In addition to the hourly operating costs, many additional costs are incurred by a vessel on a round-trip voyage. For Baltimore, these costs include canal tolls, pilotage charges from the mouth of the Chesapeake Bay to Baltimore Harbor, towing in the harbor for docking and undocking, dockage, wharfage, stevedoring, agency and attendance fees, and many other miscellaneous charges such as bunkering, water and electricity charges. Charges such as wharfage and stevedoring, because they relate directly to tons of cargo and would not affect unit savings, were not included in the calculation of total transportation costs.

UNIT TRANSPORTATION COSTS

79. Total voyage transportation costs were calculated for the range of vessel sizes expected in each commodity trade for each of those major countries and geographic areas mentioned previously. Unit transportation costs for both the existing and improved channels were calculated as the total voyage costs divided by the net cargo tonnage a ship can carry over these channel depths. A ship's carrying capacity may be restricted by controlling depths at Baltimore Harbor, at the foreign ports, or in some cases the Panama Canal. An example of the method used to calculate round-trip and unit transportation costs is presented in Table P-43. By being able to fully load this vessel on a 50-foot channel, a savings of $2.66 per ton ($14.95 - $12.29) can be realized.

80. Table P-44 presents a sample computation of average transportation costs and savings per ton for the entire vessel fleet projected to transport iron ore from Brazil for both 42 and 50-foot channel depths. Unit costs for each size ship are weighted by the percent of commerce to be moved by that ship size category to give average unit shipping costs for that trade. The difference between the costs for the 42 and 50-foot channels is the unit savings. Table P-45 presents the results of this analysis for each of the major trades considered.

TABLE P-42

ROUND TRIP DISTANCES
(nautical miles)

IMPORTS	
IRON ORE	
Canada	2,700
Brazil	5,600
Liberia	8,300
PETROLEUM	
Caribbean	3,500
SUGAR	
Americas	4,800
Other World	21,200
EXPORTS	
COAL	
Japan	20,200
Europe	8,100
GRAIN	
W. Europe	8,000
E. Europe	11,300
Mid-East	10,800
Asia	22,800

TABLE P-43
UNIT COST CALCULATION
60,000 DWT Bulk Carrier - Tubarao, Brazil to Baltimore

Round-trip costs

1.	Time at sea - 10,600 nautical miles round-trip at 15.5 knots = 684 hours		
2.	Cost at sea, 684 hours at \$1,094/hr	=	\$748,296
3.	Cost in port, 73 hours at \$736/hr	=	\$ 53,728
4.	Additional costs	=	\$ 9,100
5.	Vessel round-trip costs	=	\$811,124

Unit cargo costs

1.	Capacity (fuel, stores, bunkers, cargo)		67,200 tons
2.	Fully-loaded draft, fresh water		43 feet
3.	Bunkers, 2.95 tons/hr fuel x 342 hours		1,010 tons
4.	Ton per inch immersion factor		178 tons
5.	Draft reduction for bunkers at Baltimore		6 inches
6.	Maximum draft at Baltimore		42 feet, 6 inches
7.	Reserve fuel, 1,000 miles at 15.5 knots and 2.95 tons/hr		190 tons
8.	Cargo capacity at Baltimore, fully loaded		66,000 tons
9.	Cost per ton, fully loaded \$811,124/66,000	=	\$12.29
10.	Shut-out tonnage - 42 ft channel with 5 ft clearance = 42'6" - (42' - 5') = 66 inches x 178 tons	=	11,748 tons
11.	Cost per ton, light-loaded \$811,124/(66,000-11,748)	=	\$14.95

TABLE P-44

UNIT SAVINGS COMPUTATIONS
IRON ORE FROM TUBARAO, BRAZIL

D.W.T. (1000 Tons)	Existing Channel Depth 42 ft. Fleet Size Distribution (%)	Unit Cost ($)	Weighted Unit Cost ($)	Authorized Channel Depth 50 ft. Fleet Size Distribution (%)	Unit Cost ($)	Weighted Unit Cost ($)
-30	0	--	0	0	--	0
30-40	5	17.35	0.87	0	17.35	0
40-60	40	15.43	6.17	15	13.54	2.03
60-80	30	15.07	4.52	35	11.90	4.17
80-100	5	15.10	0.76	10	11.46	1.15
100-150	15	15.22	2.28	30	11.57	3.47
150 +	5	16.42	0.82	10	12.39	1.24
Total	100	--	15.42	100	--	12.06

Total weighted unit cost for existing channel		$ 15.42
- Total weighted unit cost for authorized channel		- 12.06
= Unit savings	=	$3.36

TABLE P-45

SUMMARY OF TRANSPORTATION COST ANALYSIS

	Costs/Ton Existing	Costs/Ton Improved	Savings/Ton
IMPORTS			
Iron Ore	42'	50'	
Canada	$ 4.40	$ 3.49	$ 0.91
Brazil	15.42	12.06	3.36
Liberia	12.47	11.09	1.38
Petroleum	39'	49'	
Caribbean	$ 6.83	$ 4.61	$ 2.22
Sugar	32'	40'	
Americas	$19.94	$14.80	$ 5.14
Other World	70.43	53.50	16.93
EXPORTS			
Coal	42'	50'	
Japan	$33.55	$28.41	$ 5.14
Europe	12.11	9.45	2.66
Grain	35'	40'	
W. Europe	$18.96	$14.24	$ 4.72
E. Europe	26.48	20.74	5.74
Mid-East	26.78	21.58	5.20
Asia	50.92	39.22	11.70

ESTIMATES OF BENEFITS

81. Estimates of transportation savings for the proposed channel improvements are derived by comparing transportation costs on deepened channels with transportation costs on the existing project channels. The average cost savings per cargo ton, as calculated above, is multiplied by prospective commerce over the 50-year project life and discounted at the Federal interest rate of 7-3/8 percent to determine average annual savings. Table P-46 presents the average annual savings for commodities and trades expected to benefit from deepening Baltimore Harbor's shipping channels to their authorized depths. Benefits for the export commodities, coal and grain, far outweigh the benefits for imports, $135,838,000 to $20,618,000. Transportation savings for coal exports ($125,795,000) account for about 80 percent of the total project benefits of $156,456,000. Iron ore imports and grain exports account for about seven percent each. Table P-47 separates the average annual savings by commodity for each of the major channel segments. Benefits for grain, petroleum, and sugar accrue at single locations in the Northwest Branch. Benefits for coal exports and iron ore imports will accrue at scattered locations throughout the port, all with direct access to the fifty-foot water depth of the main channels and the Curtis Bay Channel.

82. The above analyses exclude potential benefits in transportation savings for commerce induced to move through Baltimore as a result of the channel improvements. As mentioned previously, industry officials have estimated that as much as two million tons annually of iron ore may be diverted to Baltimore Harbor from Philadelphia for transshipment to inland steel plants. The benefits for this commerce is measured as the difference in transportation costs between shipping over to 50-foot channel at Baltimore and the authorized 40 feet at Philadelphia. Table P-48 presents a summary of the benefit analysis for the estimated two million tons of induced iron ore.

83. Nearly four million dollars in water transportation savings could be realized by diverting this tonnage through Baltimore. However, there is a high degree of uncertainty regarding the future rail rate structure from East Coast ports to inland locations, a factor which would have direct influence on any decision by importers to divert traffic. For this reason, the estimate of induced commerce is highly speculative and benefits for this commerce, therefore, are not included in the project justification.

TABLE P-46

AVERAGE ANNUAL SAVINGS
(by commodity)

	Unit Savings $/ton	Undiscounted Savings ($1,000) 1986	2000	2036	Average Annual Savings ($1,000)
IMPORTS					
Iron Ore					
Canada	$ 0.91	$ 4,027	$ 4,027	$ 4,027	$ 4,027
Brazil	3.36	2,379	2,379	2,379	2,379
Liberia	1.38	4,152	4,152	4,152	4,152
Total		$10,558	$10,558	$10,558	$10,558
Petroleum	$ 2.22	$ 4,063	$ 4,551	$ 1,887	$ 4,036
Sugar					
Americas	$ 5.14	$ 2,128	$ 2,308	$ 2,570	$ 2,276
Other World	16.93	3,505	3,809	4,249	3,748
Total		$ 5,633	$ 6,117	$ 6,819	$ 6,024
TOTAL IMPORTS		$20,254	$21,226	$19,264	$20,618
EXPORTS					
Coal					
Japan	$ 5.14	$ 15,420	$ 12,850	$ 12,850	$ 14,375
Europe	2.66	91,504	136,990	136,990	111,420
Total		$106,924	$149,840	$149,840	$125,795
Grain					
W. Europe	$ 4.72	$ 3,965	$ 4,640	$ 6,849	$ 4,611
E. Europe	5.74	1,733	2,038	2,996	2,015
Mid-East	5.20	1,056	1,399	2,834	1,405
Asia	11.70	2,012	2,012	2,012	2,012
Total		$ 8,766	$ 10,089	$ 14,691	$ 10,043
TOTAL EXPORTS		$115,690	$159,929	$164,531	$135,838
TOTAL COMMERCE		$135,944	$181,155	$183,795	$156,456

TABLE P-47
AVERAGE ANNUAL SAVINGS BY CHANNEL SEGMENT
(thousands of dollars)

Main Channel and Curtis Bay	
Iron Ore	$ 10,558
Coal	$125,795
Total	$136,353
Northwest Branch-East Channel	
Petroleum	$ 4,036
Northwest Branch-West Channel	
Grain	$ 10,043
Sugar	$ 6,024
Total	$ 16,067
TOTAL PROJECT	$156,456

TABLE P-48

AVERAGE ANNUAL SAVINGS
IRON ORE DIVERTED FROM PHILADELPHIA

Country	Cost/Ton 40' @ Phil.	Cost/Ton 50' @ Balto.	Savings/Ton	Total Annual Savings
Canada	$ 4.75	$ 3.49	$1.26	$1,260,000
Liberia	13.62	11.09	2.53	1,720,400
Brazil	16.76	12.06	4.70	752,000
			TOTAL	$3,732,400

SECTION Q

COST ALLOCATION AND APPORTIONMENT

ALLOCATION OF COSTS AMONG PURPOSES

1. Cost allocation involves the division of total project costs among various project purposes (i.e., flood control, navigation, shore erosion). The planned improvements described in Section E will serve the needs of navigation only and no other water use or purpose will be served. Accordingly, cost allocation is not warranted since all costs accrue to navigation.

APPORTIONMENT OF COSTS AMONG INTERESTS

2. Cost apportionment (cost sharing) refers to the division of purpose costs between Federal and non-Federal interests. Since only one purpose exists, this section entails the division of the total project costs.

3. Federal participation in navigation project costs is limited to sharing costs for the general navigation features such as entrance and primary access channels, turning basins, and anchorage areas. Non-Federal interests are responsible for and bear costs of terminal facilities, dredging in berthing areas and interior access channels, acquisition of the necessary lands, easements, rights-of-way, and dredge material disposal areas with retaining dikes. They must also relocate and alter affected utilities, pipelines, cables, and sewer outlets.

4. For commerical navigation projects such as Baltimore Harbor, the Federal Government bears all costs of project construction, operation, and maintenance because of the general or widespread nature of the benefits. The Federal Government maintains these waterway improvements to assure their continued transit availability. Non-Federal interests will maintain access channels, berthing areas, and provide suitable disposal areas including retaining dikes, if necessary.

5. Table Q-1 presents the apportionment of first costs between Federal and non-Federal. Project first costs are presented in Section O, "Cost Estimate."

TABLE Q-1

APPORTIONMENT OF FIRST COSTS BETWEEN FEDERAL AND NON-FEDERAL
($1,000 - February 1981 price level)

FEDERAL COSTS	
Corps of Engineers	
Channel Dredging	$188,600.0
Contingencies	22,600.0
Engineering and Design (includes $3,500 for monitoring program)	9,800.0
Supervision and Administration	11,700.0
SUB-TOTAL	$232,700.0
Coast Guard	
Aids to Navigation	$ 150.0
SUB-TOTAL	$150.0
TOTAL	$232,850.0
NON-FEDERAL COSTS	
Private Channel Dredging	$8,580.0
Contingencies	1,000.0
Engineering and Design	300.0
Supervision and Administration	600.0
Disposal of Dredged Material	
Diked Area	33,800.0
Operations and Maintenance for Diked Disposal Area	22,400.0
Utility Relocation	
Electrical Cable	2,000.0
TOTAL	$68,680.0
TOTAL PROJECT COST	$301,530.0

SECTION R

LOCAL COOPERATION

1. Construction of the authorized 50-foot project for Baltimore Harbor and Channels, Maryland and Virginia, will allow for deeper draft navigation into the port of Baltimore and produce savings in the transportation of bulk commodities. In accordance with established procedure, the State of Maryland and the Commonwealth of Virginia have been requested to provide the local cooperation for the project. The overall terms of local cooperation for the Baltimore Harbor and Channels 50-foot project, required by the River and Harbor Act of 1970 and other legislation, require that local interests must:

a. Provide without cost to the United States all lands, easements, and rights-of-way required for construction and subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of dredged material and necessary retaining dikes, bulkheads, and embankments therefor, or the costs of such retaining works;

b. Hold and save the United States free from damages that may result from the construction and maintenance of the project, except damages due to the fault or negligence of the United States or its contractors;

c. Provide and maintain at local expense, adequate public terminal and transfer facilities open to all on equal terms, and depths in berthing areas and local access channels serving terminals commensurate with the depth provided in the related project areas;

d. Accomplish without cost to the United States such utility and other relocations or alterations as necessary for project purposes;

e. Prohibit erection of any structure within 125 feet of the project channel or turning basin;

f. Establish regulations prohibiting discharge of pollutants into waters of the channels and harbor by users thereof, which regulations shall be in accordance with applicable laws or regulations of Federal, State, and local authorities responsible for pollution prevention and control;

g. Comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646, 84 Stat. 1894) and implementing regulations;

h. Comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352, 78 Stat. 241).

2. The letter of intent from Maryland is included in Addendum II, also included are letters from the Commonwealth of Virginia to the State of Maryland designating sites for placement of dredged material in Virginia and agreeing to provide items f and h of the local cooperation for the Virginia portion of the project. A copy of the draft agreement for Maryland is included at the end of this section.

3. As discussed in Section L, the State of Maryland has purchased Hart and Miller Islands for development of a contained dredged material placement. This facility will accommodate the initial quantity of material to be dredged from the Maryland channels. In addition, a long-term dredged material management plan has been developed for the State of Maryland by the Water Resources Administration, Maryland Department of Natural Resources which will promote maintenance for the life of the project. These activities indicate compliance with item a of the letter of intent for the Maryland portion of the project.

4. As discussed in Section L, the Commonwealth of Virginia has designated dredged material placement sites to accommodate the initial and maintenance quantities of material to be dredged. This activity indicates compliance with item a of the letter of intent for the Virginia portion of the project.

AGREEMENT BETWEEN

THE UNITED STATES OF AMERICA

AND

THE STATE OF MARYLAND

FOR LOCAL COOPERATION

AT THE BALTMORE HARBOR AND CHANNELS (FIFTY FOOT) PROJECT

MARYLAND AND VIRGINIA

THIS AGREEMENT, entered into this _____ day of ____________, 1981, by and between the UNITED STATES OF AMERICA (hereinafter called the "Government") represented by the Contracting Officer executing this agreement, and the STATE OF MARYLAND (hereinafter called the "State");

WITNESSETH THAT:

WHEREAS, the Baltimore Harbor and Channels project modification was authorized by Section 101 of the River and Harbor Act approved December 31, 1970 (Public Law 91-611, 84 Stat. 1818) in accordance with plans recommended in Chief of Engineers report dated September 21, 1970 and also contained in House Document Number 94-181, 94th Congress, First Session; and

WHEREAS, the State hereby represents that it has the authority and capability to furnish the non-Federal cooperation required by the authorizing documents and by other applicable law;

NOW, THEREFORE, the parties agree as follows:

1. The State agrees that, if the Government constructs the Project substantially in accordance with Federal legislation authorizing the Project, the State shall, in consideration of the Government constructing the Project, fulfill the applicable requirements of non-Federal cooperation, to wit:

a. Provide without cost to the United States all land, easements, and rights-of-way required for construction and subsequent maintenance of the Project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of dredged material and necesary retaining dikes, bulkheads, and embankments therefor, or the costs of such retaining works; and

b. Hold and save the United States free from damages that may result from the construction and maintenance of the project, except damages due to the fault or negligence of the United States or its contractors;

c. Provide and maintain at local expense adequate public terminal and transfer facilities open to all on equal terms, and depths in berthing areas and local access channels serving terminals commensurate with the depth provided in the related project areas;

d. Accomplish without cost to the United States such utility and other relocations or alterations as necessary for project purposes;

e. Prohibit erection of any structure within 125 feet of the project channel or turning basis;

f. Establish regulations prohibiting discharge of pollutants into waters of the channels and harbor by users thereof, which regulations shall be in accordance with applicable laws or regulations of Federal, State, and local authorities responsible for pollution prevention and control;

g. Comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646, 84 Stat. 1894) and implementing regulations;

h. Comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352, 78 Stat. 241).

2. The State hereby gives the Government a right to enter upon, at reasonable times and in a reasonable manner, lands which the State owns or controls, for access to the Project for the purpose of inspection, and for the purpose of operating and maintaining the Project, if such inspection shows that the State for any reason is failing to operate and maintain the Project in accordance with the assurances hereunder and has persisted in such failure after a reasonable notice in writing by the Government delivered to the Governor of the State of Maryland. No operation and maintenance by the Government in such event shall operate to relieve the State of responsibility to meet its obligations as set forth in paragraph 1. of this Agreement, or to preclude the Government from pursuing any other remedy at law or equity.

3. This Agreement is subject to the approval of the Secretary of the Army.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the day and year first above written.

THE UNITED STATES OF AMERICA

THE STATE OF MARYLAND

____
Colonel, Corps of Engineers
District Engineer
Contracting Officer

DATE:

APPROVED:

____
Secretary of the Army

____

____

____

____

____

CERTIFICATE

I, Stephen H. Sachs, Attorney General of the State of Maryland, do hereby certify that I am the principal legal officer of the State of Maryland, that Maryland is a legally constituted public body with full authority and capability to perform the terms of the agreement between the United States of America and the State of Maryland in connection with the construction of the Baltimore Harbor and Channels (Fifty Foot) Project, Maryland, and to pay damages, if necessary, in the event of the failure to perform, in accordance with Section 221 of Public Law 91-611, and that the persons who have executed the contract on behalf of the State of Maryland have acted within their statutory authority.

IN WITNESS WHEREOF, I have made and executed this Certificate this ____ day of ________________ 1981.

STEPHEN H. SACHS
Attorney General
State of Maryland

SECTION S

REAL ESTATE REQUIREMENTS

1. Real Estate investigations to date indicate that the State of Maryland has purchased the required lands, easements, and rights-of-way necessary for initial construction of the project; that other lands, easements, and rights-of-way will be available for continued maintenance of the project when needed; and that all lands, easements, and rights-of-way for disposal of material from the Virginia channels should be available at no cost. No other real estate requirements are envisioned.

SECTION T

DEPARTURES FROM THE PROJECT DOCUMENT RECOMMENDATIONS

1. The authorized plan of improvement is presented in Section E, "Authorized Plan." The economic analysis presented in Section P, "Benefits," shows that the authorized plan of improvement is still justified and accordingly, no changes in the authorized plan are indicated.

2. In addition to the authorized plan of improvements, the Project Document recommended that a single inbound lane of 50-foot depth be dredged as the initial stage of construction. This recommendation was the subject of considerable investigation and coordination. In the early 1970's, the import/export makeup of the port was such that the major portion of the deep draft traffic passing through the port was foreign imports. This domination by the import traffic was the basis for the "single inbound lane construction concept." In recent years, the import/export makeup of the port has changed to the point where neither dominates. Under current conditions, less benefits would be derived by dredging a single lane (inbound or outbound) channel first. The costs involved with additional aids to navigation, vessel traffic control systems, regulation and policing which would be required by a single lane channel do not warrant the benefits to be derived. Also, the Coast Guard has adamantly opposed the operation of a single lane channel and the Maryland Pilots have cited numerous safety problems involved with operation of such a system.

3. Consequently, the construction schedule, as shown in Section M, will provide a full width 50-foot channel with project completion schedule for 1986.

SECTION U

PUBLIC LAW 92-500

1. Section 404 (r) of Public Law 92-500, as amended, provides that an Environmental Impact Statement (EIS) may be submitted to the Congress evaluating the discharge of dredged or fill material into waters of the United States through the authorization or appropriation processes for those projects specifically authorized by Act of Congress. Further, the evaluation of the discharge is to be accomplished through the application of guidelines contained in Section 404 (b) (1) of the Law.

2. Accordingly, a "404" evaluation has been performed for the proposed action described by this report and is contained in the project EIS for submittal to the Congress.

SECTION V

RECOMMENDATIONS

1. It is recommended that the project plan submitted in this Combined Phase I - Phase II General Design Memorandum be approved as the basis for construction of the deepening of the Baltimore Harbor and Channels, Maryland and Virginia. The authorized plan of improvement consists of:

a. Deepening the Cape Henry Channel to 50 feet at the existing width of 1,000 feet, with widening at bends.

b. Deepening the York Spit Channel to 50 feet at the existing width of 1,000 feet, with widening at bends.

c. Enlargement of the Rappahannock Shoal Channel to a depth of 50 feet and width of 1,000 feet.

d. Deepening the main ship channel from Chesapeake Bay to Fort McHenry to a depth of 50 feet at the existing width of 800 feet, with widening at bends and at the Craighill Entrance.

e. Deepening the Curtis Bay Channel to a depth of 50 feet at the existing width of 600 feet, and deepening of the 950-foot wide and 980-foot long turning basin at the head of channel to the same depth.

f. Deepening the Northwest Branch-East Channel to a depth of 49 feet from the depth existing at the time of construction at a width of 600 feet, and deepening of the 950-foot wide and 950-foot long turning basin at the head of the channel to the same depth.

g. Deepening and extension of the Northwest Branch-West Channel to a depth of 40 feet from the depth existing at the time of construction, at a width of 600 feet, and with an irregularly shaped turning basin at the head of the channel 40 feet deep and 2,000 feet long with a maximum width of 1,150 feet.

ADDENDUM I

AN OVERVIEW OF DREDGED MATERIAL MANAGEMENT IN THE CHESAPEAKE BAY

1. The long history of the development of navigational improvements in the Nation's waterways has evolved a specific relationship between the Federal Government and non-Federal sponsor pertaining to financial cost-sharing and other matters. In this regard, it has become established policy, with few exceptions, for the non-Federal sponsor to "provide without cost to the United States all lands, easements, and rights-of-way required for construction and subsequent maintenance of the Project . . . including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of dredged material and necessary retaining dikes, bulkheads, and embankments therefor, or the costs of such retaining works." The Baltimore Harbor and Channels, Maryland and Virginia, requires that non-Federal interests "provide without cost to the United States all lands, easements, and rights-of-way required for construction and subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of spoil, and also necessary retaining dikes, bulkheads, and embankments therefor, or the cost of such retaining works."

2. In recent years, the Federal and non-Federal community directly involved with dredging and disposal programs have become increasingly aware of the need to plan more comprehensively for disposal needs as traditional methods of disposal become inadequate for various reasons, to current and future needs. Within the Chesapeake Bay area, the State of Maryland and Commonwealth of Virginia have actively engaged in dredged material management programs. At the Federal level, the Corps of Engineers (COE), Environmental Protection Agency (EPA), and National Oceanic and Atmospheric Agency (NOAA) have been actively involved in questions related to dredged material management in the Chesapeake Bay for the purpose of understanding the factors currently affecting disposal options within the Bay for deepening of the Baltimore Harbor Channels, and the investigations performed to assure acceptability within the meaning of the authorizing language.

DEVELOPMENT OF MARYLAND's DISPOSAL PROGRAM

3. Traditionally, dredged material from the various navigation projects in Maryland has been placed into open water sites within the State of Maryland. The Maryland Board of Public Works has had the responsibility for designating such sites. Opposition by watermen to the open water disposal of sediment has existed from the turn of the century to the present day. In 1968, the Board recommended that the State provide funds for the study, design, and construction of a suitable facility for the disposal of dredged material. The 1969 General Assembly authorized $13 million for the construction of this diked area. In 1970, the State's consultant issued a report selecting the Hart-Miller Islands site as the most suitable for a containment facility. In 1975, a law was passed by the Maryland General Assembly (annotated Code of Maryland, Natural Resources Article, Sections 8-1601-1605) declaring all bottom material lying upriver of line drawn across the Patapsco from Rock Point to North Point to be contaminated, and making it illegal to dispose of this material into the open water of the Chesapeake Bay.

4. The selection of the Hart-Miller Islands site was made after a detailed study of various disposal methods. The only feasible solution at that time, based upon the need in Maryland, was the construction of a contained disposal site. Seventy possible containment sites were evaluated. The results of the evaluation are shown in Table 1, which is reprinted from the 1970 report. Subsequently, the State requested a permit from the Corps of Engineers for the construction of the Hart-Miller Islands site. An Environmental Impact Statement was prepared by the Corps for the permit action and a permit was granted by the Corps of Engineers on 22 November 1976 following rigorous coordination and review by others. However, much opposition to the Hart-Miller Islands site arose and opponents sought alternatives to the use of Hart-Miller Islands. A discussion of these alternatives and their feasibility follows.

ON-LAND DISPOSAL

5. The State of Maryland investigated this possibility in their 1970 site selection study. They found certain disadvantages to this alternative, assuming sites could be found with sufficient capacity. Transportation to the site would be by truck, which means increased vehicular traffic. The spoil material being in a more or less soupy condition would likely result in water leaking from the trucks. The spoil could be placed on land near the road network and be allowed to drain somewhat before rehandling. Additional costs would be expected due to rehandling. Since much of the material is contaminated, adequate controls would be necessary to preclude the possibility that leaching or drainage from such a disposal area might carry hazardous concentrations. Since the fill material would in effect act like a reservoir of water, a containment structure on dry land would have to be built with consideration to foundation preparations, site clearing, etc., normally experienced with construction of an aquatic reservoir project.

6. An alternative to the use of water-oriented containment sites is the use of areas such as inactive rock quarriers or sand and gravel pits. Consideration included all possible modes of transportation of dredged material. Dredged material can be transported by pipelines if the problems of pipeline right-of-way can be solved. The possibility of leakage and seepage into groundwater supplies could present a serious drawback. There are no local quarriers that will individually accommodate even a small fraction of 50 million cubic yards of material. Even the sum capacity of many small inactive quarries that could be filled one at a time is far less than the required volume, assuming that right-of-way and environmental considerations could be met.

UTILIZATION OF DREDGED MATERIAL TO RECLAIM STRIP MINES

7. In the Hart-Miller Islands EIS, utilization of dredged material to reclaim strip mines was investigated as an alternative to the Hart-Miller Islands site. While costs would be high, benefits of this method would be rehabilitation of barren strip mine lands. However, there is a potential for contamination of groundwater from placement of the dredged material and high transportation costs. In order to prevent groundwater contamination, contaminated material would have to be separated out. This method is not presently feasible.

TABLE 1

EVALUATION OF POTENTIAL SITES

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11		#12	#13	#14
NO	NAME	DIST. FROM BALTO. HARBOR (NAUT. MILES)	LATITUDE	LONGITUDE	CAPACITY $YD^3 x10^6$	AREA $YD^3 x10^6$	CHART NO.	ADV.	DISADV.	OVER-RIDING FACTORS Adv. (a)	OVER-RIDING FACTORS Dis. (b)	METHOD	TYPE	REC.
1	Susq. R. Delta	39	39°-30'N	76°-03'W	70	11.52	572	ABCN	AEBC		AE	Dike	Mud Flat	No
2	Old Woman's Gut	28	39°-24'-45"N	76°-09'W	22.7	3.78	572	ABC	ACFG		FG	Marsh	Marsh	No
3	Taylor Island	27	39°-24'N	76°-10'-30"W	7.2	1.2	572	AC	AFCG		F	Marsh	Marsh Isl.	No
4	Abbey Pt. to Locust Pt.	25	39°-22'N	76°-13'W	13.2	2.2	572	AC	AFCG		F	Marsh	Marsh	No
5	Lego Pt.	23	39°-20'-30"N	76°-16'W	8.64	1.44	572	AC	AFCGI		FG	Marsh	Marsh	No
6	Hawthorne Cove	19	39°-19'N	76°-21'W	41.4	6.9	549	ACDE F	FC		C	Marsh	Marsh	No
7	Gunpowder Neck	17	39°-18'-30"N	76°-21'W	20	3.9	549	ACDF	CFJJK G		JK	Marsh	Marsh	No
8	Pooles' Island	16.5	39°-17'N	76°-15'-30"W	75-100	10.08	549	DHB	JGMIL EC	HB	LE	Dike	Water & Isl	Marg.
9	Worton Pt.	20.5	39°-19'N	76°-10'-50"W	20	3.24	549	AD	GNMFA		NG	Marsh	Marsh	No
10	Back River	19	39°-18'-30"N	76°-31'W	6	1.0	549	CFA	FNB		FB	Marsh	Marsh	No
11	Muddy Gut	16	39°-17'-20"N	76°-26'W	6	1.0	549	AE	NCFB		F	Marsh	Marsh &Cove	No
12	Hart-Miller Isl	11	39°-15'N	76°-22'-30"W	100-200	26	549	ABDF IKJP	NM	BDJ		Dike	Isl.& Water	Yes
13	Black Marsh	9	39°-13'-30"N	76°-25'W	41	5.7	549	ABCD FIJQ	NGM	BQJ	N	Dike & Marsh	Marsh Water	Yes Cond.
14	Patapsco River Marsh	3.3	39°-14"N	76°-37'-30"W	15	2.5	549	ADCE JMQ	CFN	QD	N	Marsh	Marsh	Cond.
15	Thomas Cove	1.5	39°-12'-30"N	76°-33'W	3.8	0.64	549	ADJM	FN		F	Marsh	Marsh &Cove	No

TABLE 1

EVALUATION OF POTENTIAL SITES

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11 (a)	#11 (b)	#12	#13	#14
16	Hawkins Pt.	2	39°-12'N	76°-32'-10"W	15	2.56	549	ADM	FN		N	Marsh	Marsh Water	No
17	6-7-9 Ft Knolls	9	39°-9'N	76°-23'-15"W	100-250	23.18	549	ABDI	ELMN	BD	LN	Dike	Water	Cond.
18	Swan Pt.	14	39°-9'-20"N	76°-15'-30"W	9	1.5	549	D	FGD		F	Marsh	Marsh	No
19	Eastern Neck Island	21	39°-02'-50"N	76°-13'-20"W	48	8	549	B	ADGJM		JG	Marsh	Marsh	No
20	Piney Pt.	24	39°-02'-40"N	76°-10'-40"W	6	1	549		ABFDG		F	Marsh	Marsh	No
21	Sandy Pt.	16	39°-01'N	76°-24'W	1	0.2	549		ADFN		FN	Marsh	Marsh	No
22	North-South Trench	16 to 33	38°-52'N	76°-24'W	200+	50	550	LFOB	MOPQ	LB	OQ	Open Dump	Water	Cond.
23	Kent Narrows Area	20	38°-58'N	76°-14'W	36	6	550	I	ACGHL D		DH	Dike & Marsh	Marsh Water	No
24	Poplar Ils. Group	30	38°-46'N	76°-22'-40"W	12	2.25	550	C	ACDFH M		DF	Marsh	Marsh	No
25	North-South Trench	33 to 41	38°-41'N	76°-25'-30"W	100+	16	551	FDLOB	AMOPQ	LB	OQ	Open Dump	Water	Cond.
26	Deep Water Hole	44	38°-33'N	76°-26'W	4	1.4	551	FLOP	AFNOPQ		F	Open Dump	Water	No
27	Deep Water Hole	44	38°-33'-30"N	76°-23'-20"W	16	4	551	FLOP	AFDMOP Q		FD	Open Dump	Water	No
28	James Island	47	38°-31'N	76°-20'-30"W	21	3	551	CF1	ACDFO		DF	Marsh	Marsh	No
29	Deep Water Hole	41	38°-39'N	76°-18'-30"W	24-70	2.9	551	BFLOP	ADELO PQ		DQL	Open & Dike	Water	No
30	Choptank Deep Hole	47	38°-38'N	76°-10'W	8	2	551	FLOP	ADFOPQ		DF	Open Dump	Water	No
31	Hills Pt. Cove	46	38°-34'N	76°-18'W	13.5	2.25	551	CGI	ACDFH		DF	Marsh & Dike	Marsh &Cove	No
32	Woolford Neck	52	38°-34'-20"N	76°-13'-50"W	9	1.5	551	CFG	ABCDFG		FD	Marsh	Marsh	No

TABLE 1

EVALUATION OF POTENTIAL SITES

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11 (a)	#11 (b)	#12	#13	#14
33	North-South Trench	48 to 64	38°-23'N	76°-20'W	400-800	41.6	553	ABFL OP	AOPQ	BL	AO	Open Dump	Water	Cond.
34	Slaughter Creek Marsh	53	38°-27'-40"N	76°-15'-30"W	12.6	2.1	553	CP	ABCFG' H		FB	Marsh	Marsh	No
35	Moneystump Swamp	56	38°-26'-30"N	76°-13'W	50	9.25	553	BC	ABCG		GB	Marsh	Marsh	No
36	Barren Island Area	60	38°-20'-30"N	76°-15'-30"W	40	6.5	553	B	ACDHL M		AD	Dike	Marsh Water	No
37	Hooper Island Marshes	65	38°-17'-30"N	76°-11'W	24	4	554	C	ACDFG H		AD	Marsh	Cove& Marsh	No
38	Deep Trench	60 to 70	38°-13'N	76°-15'W	100	20	554	ABFL OP	AMOPQ		AQ	Open Dump	Water	No
39	Deep Trench	70 to 82	38°-09'N	76°-14'W	50	24	557	ABFL OP	AMOPQ		AQ	Open Dump	Water	No
40	Bloodsworth Island	65	38°-10'N	76°-03'W	100-270	45	555	BC	ACDGH M		AH	Marsh	Marsh	No
41	South Marsh Island	70	38°-06'N	76°-02'W	100-150	25	555	BC	ACDGH M		AD	Marsh	Marsh	No
42	Holes off James Island	77	38°-00'N	75°-54'-30"W	100	10	555	BILO	ADEHP Q		AQ	Open Dump	Water	No
43	Roach Pt. (Elk Neck)	42	38°-22'-30"N	76°-58'W	9	3.6	572	AFIC P	ABF		FA	Dike	Water	No
44	Camp Rodney (Elk Neck)	40	39°-31'N	76°-00'W	15	3.85	572	ACI	ABF		FA	Dike	Water	No
45	Rocky Pt. (Elk Neck)	38	39°-29'N	76°-01'W	38	7.74	572	ACFI	ACFB		A3	Dike	Water	No
46	Carpenter Pt.	42	39°-32'-10"W	76°-00'-30"W	7	2.75	572	AP	ABEF		F	Dike	Water	No
47	Boat Ho (S. Gable) Havre de Grace	40	39°-31'N	76°-06'W	24	8.6	572	AJG	ABEFL N		AB	Dike	Water	No
48	Turkey Pt.	36	39°-27'-30"N	76°-02'-45"W	41	6.82	572	ACIJ	FAEB		AF	Dike	Water	No
49	Spesutie Is.	36	39°-26'-25"N	76°-04'-20"W	10	2.42	572	AIJ	AFB		AF	Dike	Water	No

TABLE 1

EVALUATION OF POTENTIAL SITES

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	(a)	(b) #11	#12	#13	#14
50	Sassafras Neck	34	39°-25'N	76°-01'-50"W	20	4.84	572	AJGQF	AFE		AF	Dike	Water	No
51	Shad Battery Shoal	26	39°-21'N	76°-11'W	94	9.4	572	ABHQ	ACL		A	Dike	Water	No
52	Lego Pt. to Ford Pt.	26	39°-19'-20"N	76°-16'W	22	3.74	572	AFGJI	AFBIJ EG		AJF	Dike	Water	No
53	Worton Pt.	23	39°-17'-40"N	76°-11'-10"W	20	4.8	549	FGIJ	ADGE		AFD	Dike	Water	No
54	Swan Pt. to Fairlee Crk.	17.5	39°-08'N	76°-14'W			549	Q	DAGLF B		DG	Marsh & Dike	Marsh Water	No
55	Gunpowder Neck (East)	25	39°-18'-40"N	76°-16'-30"W	28	4.62	549	ACDF	CFIJK G		JKA	Marsh & Dike	Marsh Water	No
56	Mid Channel	11	39°-13'-50"N	76°-20'W	54	6.75	549	DGL	LDFC		LD	Dike	Water	No
57	Gunpowder Neck (South)	14	39°-16'-30"N	76°-18'-40"W	71	10	549	ABI	ALCBI		BC	Dike	Water	No
58	Hawk Cove	16	39°-15'-50"N	76°-23'-30"W	4	2.8	549	AIDGF	FNB		FN	Dike	Water	No
59	Mitchell's Bluff Buoy	19.5	39°-14'-25"N	76°-16'W	65	8.0	549	FGID	DFC		D	Dike	Water	No
60	Cutoff angle Brewerton-Tolchester	12.5	39°-10'N	76°-19'25"W	85	9.0	549	BDI	CDEL	B	DE	Dike	Water	Marg.
61	Man-O-War Shoals	7	39°-10'-30"N	76°-23'W	75-100	13.3	549	BDEH NQ	CDEL	BD	EL	Dike	Water	Marg.
62	Patapsco River Mouth	3.5	39°-11'N	76°-28'-30"W	75-100	10.7	549	NQBDE HIFG	C	BD		Dike	Water	Yes
63	Swan Pt. to Eastern Neck	17.5	39°-05'N	76°-15'W			549		DEBGL		DG	Marsh & Dike	Water Marsh	No
64	Swan Pt. Channel Angle	14.5	39°-05'-30"N	76°-19'-10"W	132	10.14	549	BD	CDE	BD	C	Dike	Water	Marg.
65	Bodkin Neck to Sandy Pt.	12.5	39°-05'N	76°-24'-30"W			549	BDI	DEHLMN		N	Dike,	Shore Water	No

TABLE 1

EVALUATION OF POTENTIAL SITES

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11		#12	#13	#14
66	Craighill Entrance	15	39°-03'-40"N	76°-21-40"W	124	9.1	549	BDFJ	CDEM	B	CD	Dike	Water	Marg.
67	Belvidere Shoal	12	39°-06'N	76°-22'-30"W	100-150	14	549	BDFGI Q	CD	BD		Dike	Water	Yes
68	Cutoff Angle (South)	12	39°-07'N	76°-20'W	153	13.5	549	BDFI	CDB	BD	C	Dike	Water	Marg.
69	Kent Is. (West side)	19	39°-00'N	76°-21'W			550	J	CDGHM Q		DG	Dike	Shore Water	No
70	Cedar Hurst	33	38°-49'-30"N	76°-29'-30"W			1225	J	ADEFN		FD	Dike	Water	No

The following is an explanation of columnar entries in Table 1:

Column 1--Numerical Listing.

Column 2--Identifying Name of Area. Either the appropriate name of the area or the name of the nearest prominent land or landmark.

Column 3--Distance from Baltimore Harbor. Distance in nautical miles from the Fort McHenry light. Numbers indicate approximate distances to the spoil areas by the nearest water route.

Column 4--Latitude. Approximate latitudinal position of the centroid of the indicated spoil area.

Column 5--Longitude. Approximate longitudinal position of the centroid of the indicated spoil area.

Column 6--Capacity in Cubic Yards. Capacity is approximate and is based on multiplication of the estimated area by the assumed depth of spoil in yards. For the purposes of estimation, the depth of spoil has been taken to be average depth below mean low water plus 18 feet above mean low water. Actual capacitites will vary depending on dike or area configuration and height above mean low water to which spoil is to be deposited.

Column 7--Area in Square Yards. Approximate usable area which has been considered. Actual area will depend on chosen configuration.

Column 8--Chart Number. The number of the Coast & Geodetic Survey Chart on which the area can be located.

Column 9--Advantages. Letters indicate advantages of area for use as spoil disposal. (Meanings of letters are shown in "Advantages" key which follows.)

Column 10--Disadvantages. Letters indicate disadvantages of area for use as spoil disposal. (Meanings of letters are shown in "Disadvantages" key which follows.)

Column 11--Overriding Factors. In Column 11a (advantages) and/or 11b (disadvantages) are shown the factors which are considered to be overruling in deciding whether to accept or reject the area in question for consideration as an area for spoil disposal. Areas with entries in both columns indicate those considered to be worth further consideration but marginal, depending on condition of use.

Column 12—Method. Indicates method of use as spoil disposal area as follows:

- ° Dike - Diked disposal area
- ° Marsh - Land disposal area which will require method for unloading and distributing spoil over the marsh area.
- ° Dike & Marsh - Use of a combination of offshore dike and disposal over surface of marsh.
- ° Open Dump - Disposal of spoil directly overboard with no artificical enclosure to contain spoil.

"ADVANTAGES" KEY-EXPLANATION OF LETTERS

A—Not Near Oyster Beds. Indicates that the area in question is far enough away from a usable, healthy oyster bed so that there should be no question of oyster bed pollution.

B—Useful Size. Indicates that the area in question is capable of handling at least 20 million cubic yards of spoil.

C--Low Use Area. Generally applied to land or marsh areas being considered, indicates that the area has only occasional use, is closed to the public, has very low popluation density, or is not suitable for residential or commercial use.

D--Close to Dredging Areas. Indicates that the area is in the immediate vicinity of Baltimore Harbor or its dredged approach channels, thus requiring very little transportation for dredged spoil.

E--Not a Wildlife Area. Refers to fast land or wetlands which are not considered to be wildlife refuges or breeding grounds.

F—Not a Navigational Obstruction. Indicates that use of the area would not interfere with present ship or boat channels or the use of navigational aids and would not present a hazard to waterborne traffic on the Bay.

G—Non-interference with Water Flow. Indicates that the area is sufficiently removed from the main Bay and river currents that its use would cause no appreciable change in normal water circulation.

H--Presently Used As a Spoil Area.

I--Diking Feasibility. Indicates that the area could be used as a diked disposal area within reasonable economic limits. Includes short channel requirements, reasonable water depths, availability of nearby diking material, and reasonable access for work.

J--High Use Value as Reclaimed Lands. Accessibility is significant in this category.

K--Reasonably Acceptable to Conservationists. No appreciable ecological damage.

L--No Construction Necessary. Refers to area which could be used as open water dumping area, eliminating use of dikes, sheet pilings or access facilities.

M--Low Value Wetlands. Indicates marshy areas which are not suitable for wildlife or are only marginally suitable--generally due to proximity to heavily populated or industrial areas.

N--Probably Already Polluted. Indicates areas which probably have been damaged already by pollution so that use as spoil area is not likely to cause significant degradation of their use value.

O--Familiar Methodology. Indicates areas in which traditional methods of spoil handling can be used with no change in techniques or facilities.

P--Fairly Economical. Indicates area where low cost or no facilities would be required-generally applied to open water dumping areas.

Q--Good Accessibility. Indicates that the area can be used either with no additional channel or with only a short channel; that the area is easily accessible for needed construction work; that reclaimed land could be easily reached and/or spoil could be transported to the immediate vicinity by a direct route.

"DISADVANTAGES" KEY-EXPLANATION OF LETTERS

A--Distance Too Great. Indicates that the distance from the Baltimore Harbor dredging area to the disposal site is considered to be too great for practical, economical use.

B--Difficult Access. Indicates that the area would be difficult or impossible to reach with a hopper dredge, would require use of an extremely long pipeline, or would require a long circuitous route to reach the area.

C--Expensive Development. Indicates that use of the area would require expensive dike configurations, long channels, impoundment areas, long pipelines, and expensive spoil distribution and/or handling systems.

D--Proximity to Oyster Areas. Indicates that the area is close enough to healthy oyster beds so that its use would be likely to damage the oyster beds.

E--Disturbance of Water Flow. Indicates that use of the area would be likely to seriously interfere with the normal water circulation patterns in the Bay or in adjacent waterways.

F--Insufficient Size. Indicates that the area is too small to be of any practical use as a spoil disposal area for the Baltimore Harbor project.

G--Valuable Wildlife Area. Usually pertains to wetlands thought to be of high value by authorities.

H--Valuable Crabbing Bottoms.

I--Undetonated Shells Present. Indicates that past use of the area as an ordnance impact area has led to the likelihood of spoil disposal operations or construction of sites being in danger from unexploded ordnance devices.

J--U.S. Government Owned Land. Indicates that ownership by the Federal Government is likely to make the area unobtainable for use as a spoil disposal area.

K--Ordnance Impact Area. Indicates present use of area as a target for ordnance testing, thus creating subsequent danger to spoil disposal operations.

L--Obstruction or Danger to Navigation. Indicates that use of the area as a diked disposal area would either obstruct channels presently used by waterborne craft or would under some circumstances constitute a danger to ships or boats.

M--Disturbance of Fishing Areas. Indicates that use of the area for spoil disposal will interfere with or prevent use of popular sport fishing areas, move or damage commercial fishing areas, or endanger fish spawning areas.

N--Conflicting Present or Intended Land Use. Indicates that the area in question is being used or proposed for purposes of sufficient magnitude or importance either to cause the land or water to be unavailable or to create a great deal of controversy about its proposed use as a spoil area.

O--Spread of Spoil Outside of Designated Area. Applies to undiked areas in which the spoil is likely to spread to considerable distance outside the intended spoil area boundaries.

P--Sentiment Against Open Dumping.

Q--Possible Danger to Bay Ecology. Indicates that use of the area for spoil disposal can reasonably be supposed to have a marked disturbing effect on the ecology of the Chesapeake Bay.

USE OF DREDGED MATERIAL FOR BENEFICIAL PRODUCTS

8. In 1973, the State of Maryland contracted with Roy F. Weston, Incorporated, to study the feasibility of producing beneficial products from Baltimore Harbor dredged material. Consideration was given to natural aggregate, synthetic aggregate, lime, bricks and related clay products, and rock or mineral wool. Of the productive uses investigated, the only one that was technically and economically viable was the manufacture of synthetic aggregate. However, the high energy requirements of the process and the long lead time until production (7 years) would still require the identification of interim alternative disposal methods.

OPEN WATER DISPOSAL IN THE ATLANTIC OCEAN

9. This disposal option was evaluated in the COE EIS for Hart-Miller Islands. It is assumed that ocean disposal of dredged material could have similar or less environmental impacts to open water disposal in Chesapeake Bay. However, costs for ocean disposal would be much greater.

FURTHER STUDIES

10. Subsequent to coordination of the Hart-Miller Islands DEIS, the Maryland Department of Natural Resource accomplished further State-level review of Hart-Miller Islands and alternatives for dredged material disposal. In 1975, Roy Mann Associates was contracted to perform this review. The study reviewed the previously discussed alternative methods of disposal. This review concluded, "To date, no alternative means of dredged material disposal have been shown to be free of potentially serious environmental or economic difficulties."

11. In 1977, the State of Maryland prepared a report entitled, Management Alternatives for Dredging and Disposal Activities in Maryland Waters. The report is an analysis of the present disposal situation and suggestions for dealing with the problems. The report describes various beneficial uses of dredged material such as beach nourishment, marsh creation, land fill, lightweight aggregate, and land reclamation. However, it appears that while these methods will be receiving more consideration in the future, these methods are not presently feasible.

12. Currently, the Maryland Department of Natural Resources is monitoring current COE maintenance dredging operations in an effort to determine the effects of overboard disposal on the Chesapeake.

DREDGE MATERIAL MANAGEMENT EFFORTS IN THE COMMONWEALTH OF VIRGINIA

INTRODUCTION

13. From the year 1607 when the Godspeed, the Discovery, and the Susan B. Constant brought the Jamestown settlers through Tidewater to the banks of the James River, the link Virginia has had with the sea has always been close. Safe natural harbors and good access to the sea via rivers and the Chesapeake Bay have greatly added to the prosperity and development of the Commonwealth. It is not surprising that Cape Henry was the site of the first Federally constructed lighthouse

to guide ships safely into the rapidly developing Hampton Roads Harbor. This area made up of Norfolk, Portsmouth, Chesapeake, Newport News, and Hampton has some of the finest and best known deep-draft ports in the world for both commercial and naval shipping. Although Hampton Roads is a good natural harbor, the dynamics of shifting currents and flowing bays and rivers deposit sand and mud that if allowed to permanently accumulate would seriously hinder the ability of the harbor to provide safe navigation for the largest of ocean vessels. The Commonwealth of Virginia has other harbors that suffer from the effects of water-borne sediment transport; however, the magnitude of this problem shrinks rapidly when compared to the problems with providing safe navigation in Hampton Roads through periodic dredging and safe and economical spoil disposl.

14. Historically, shipping has relied on maintenance of sufficent channel depths to ensure safe and efficient vessel movement. Such maintenance requires periodic and regular removal of several million cubic yards of spoil material. This massive dredging operation often requires extraordinary efforts to locate, construct, and manage suitable spoil disposal sites. In many instances, years of minimum concern for water quality has resulted in contaminated bottom sediments that further complicates the disposal problem and necessitates careful measures to preserve environmental quality.

THE NEED FOR SPOIL DISPOSAL

15. In the earliest days of dredging, open-water disposal was the common practice. Sites in the Hampton Roads Harbor were used. By the turn of the century, the quantity of material being dredged had increased, and a disposal site outside the Hampton Roads Harbor was utilized. Later, and with bulkheading, more extensive use was made of the original harbor disposal area. Other sites were developed near the Lynnhaven River and north of Thimble Shoal channel, and used until security reasons and amphibious activities during World War II curtailed disposal here. Dredging continued during the war and material was deposited in two areas west of the entrance to Hampton Roads (opposite Newport News-Hampton). However, these areas were filled by the war's end.

16. Near the end of World War II (1944), the Congress authorized a study to determine a more permanent and lasting means for disposing of dredged material from Hampton Roads. As a result, development of a disposal area at Craney Island was recommended and approved by the Congress. Actual construction of the area was completed in 1957. The initial capacity for storage of dredged material was originally estimated to be about 100 million cubic yards based on an assumed final elevation of +18 feet mean low water (MLW). Over 130 million cubic yards have been placed in Craney Island to date with the proposed raising of levees to +30 feet MLW and use of other management practices such as dewatering, Craney Island will serve as a disposal area for years to come.

STATUS OF HARBOR DEVELOPMENT AND NEED FOR SPOIL DISPOSAL

17. The first Federal project in Hampton Roads was adopted in 1907 providing for navigational improvements to a depth of 25 feet in the Elizabeth River and portions of the Eastern and Southern Branches. Since this first Federal project, the Congress has authorized numerous other improvements, including periodic maintenance of project depths. The existing project, authorized by the River and Harbor Act of 1965, provides for a main channel depth of 45 feet to the major port facilities of both Norfolk and Newport News. A feasibility study recommending deepening certain channels in Hampton Roads to 55' has recently been completed by the Norfolk District recommending dredged material to be placed in an ocean site and in Craney Island.

18. Since its completion in 1957, Craney Island has received the spoil generated by maintenance, private, and permit dredging activities in Hampton Roads. In 1974 the Norfolk District, Corps of Engineers, estimated that the area had 5 and 6 years of useful capacity before being completely filled. The Waterways Experiment Station (WES) recently conducted a management study for Craney Island. Based on maintaining harbor conditions as they are, the study indicates that Craney Island could be used for 19 years with current disposal methods and raising levees (+30 MLW). By utilizing other management practices, such as dewatering, the Craney Island site could be used for 36 years. The necessity for maintaining a disposal area has been expressed by various public and private interests, particularly those engaged in the protection and the enhancement of the port economy and Virginia's marine environment. Recognizing the importance of the Craney Island Disposal Area and the need for a suitable replacement, the Committee on Public Works of the U.S. House of Representatives adopted a resolution on 3 October 1968 requesting a study be completed on alternatives on dredge spoil disposal in Hampton Roads. A feasibility report on the Norfolk Harbor and Channels, Virginia, deepening and disposal was prepared in July, 1980, which presented dredging and spoil needs for channels and anchorages in the Hampton Roads area. However, the choices of alternative disposal sites was not restricted to the immediate area, or to sites that would accommodate spoil disposal from current dredging methods. A number of dredging and disposal plans were considered. Several of them were discarded early having been found to be seriously deficient on either economic or environmental grounds or both. Detailed analysis of the remaining plans was accomplished with a view to the technical, economic, environmental, and social needs of the study area.

THE PLAN

19. Formulation of a plan to functionally supplement the Craney Island Disposal Area involved consideration of a number of alternatives. Each plan was considered on the basis of its costs, benefits, environmental and social factors, and ability to respond best to the dredging and disposal needs of the study area and considered the following objectives:

- Provide a disposal area to receive dredged material from maintenance and new work dredging activities in Hampton Roads, for a period of 50 years, commencing at the time when Craney Island Disposal Area is filled to design capacity.

- Minimize the destruction of bottomlands, wetlands, coastal zones, and marine life resources in the Hampton Roads area.

20. It was necessary that the report recommend the alternative that was in the best overall public interest, considering the planning objectives, the benefits and costs, and significant economic, social, and environmental effects. In this regard, a set of criteria were developed in an effort to assure that a fair and objective appraisal of the merits and disadvantages of the various alternatives could be accomplished.

21. The criteria by which all alternative plans were evaluated were as follows:

- The plan should be capable of handling all types of dredged material, in small or large quantities, and be able to accommodate all types of dredging equipment.

- The system should function effectively in adverse weather conditions, be capable of continued operation if a portion of the system is damaged, and if located in overboard areas have levee construction to a height sufficient to withstand storm tides and wave action.

- The plan should have a useful life of at least 50 years.

- The plan should be publicly acceptable, be adaptable to public needs, and exhibit salvage or land reclamation benefits.

- The plan should possess minimal adverse environmental effects, conform to existing public health standards, be safe with respect to operations on or adjacent thereto, and be as aesthetically pleasing as possible.

- The plan should minimize the commitment of natural resources and avoid damage or destruction of important historic or cultural resources.

- The plan should be consistent with local, regional, state, and national plans for port and industrial growth, land use, solid waste management, water and pollution abatement, transportation, and recreation.

- The selected plan should be competitive with other plans regarding the total cost, operation and maintenance, replacement, a rapid cutback in costs if the load is reduced, and the overall economic impact on the surrounding area.

22. Certainly no plan could be expected to satisfy fully all criteria stated. The overall favorable response to application of criteria was thought to be a measure of each plan's merit. Selection of the best plan (or plans) emphasizes optimization in terms of technical, cost-performance, environmental, and social parameters.

23. Possible solutions to the problem of spoil disposal in Hampton Roads included:

- Reducing the amount of material to be dredged.

- Conventional dredging with open-water disposal, or confinement within an area similar to the present site.

- Recycling material to land from whence it originated.

- Reclamation of marginally useful land.

- Commercial usage.

24. It was not economically feasible or practical to appreciably reduce or stop dredging in Hampton Roads. Certainly maintenance dredging could be reduced at the expense of losing some cargo trade. However, the existing project dimensions must be maintained in the interest of national defense to accommodate large naval vessels.

25. The possibility of reducing the required rate of maintenance dredging by reducing the rate of shoaling would require extensive knowledge of the source of the shoal material or the mechanism of its transport and deposit.

26. In Hampton Roads, conventional means of dredging include hopper, hydraulic pipeline, and bucket and scow dredging. For many years a conventional means of disposal has been in open water. Knowledge that much of the spoil in Hampton Roads is polluted and could adversely affect the environment of open-water areas would prohibit unrestricted use of this means of disposal in the future. It is assumed that ocean disposal of good quality (non-polluted) material, as that which comes from Thimble Shoal Channel, can be continued. Approximately 80% of Norfolk Harbor material meets EPA/COE guidelines for ocean dumping. Therefore the current goal is ocean disposal for suitable material and confinement in Craney Island for material which does not meet ocean disposal criteria. In addition, the Norfolk District is looking into removing material from Craney Island which meets ocean disposal criteria to increase capacity of Craney Island for material not suited for ocean disposal. With regard to pollution abatement, the better solution to the problem of spoil disposal is in using an area such as the existing Craney Island Disposal Area. At such a site, spillways or sluices are used to control effluent density and effect a more positive retention of all material.

27. Another possible solution for disposal of dredged material is to seek some means for its beneficial use rather than characterizing it as a "waste to be disposed of." Some possible uses in this manner would include 9a) agricultural, construction, lowland, or topsoil fill; (b) creation of marshland; (c) rehabilitation of blighted areas such as strip mines, eroded areas, borrow pits, and gravel pits; (d) creation of hills or islands for aesthetics, recreation, residential-industrial-or commercial development, and others. The greatest drawback to this solution is in developing a technically possible and economically feasible plan or combinations of plans, whose useful life would amount to at least 50 years, and whose capacity could accommodate an estimated annual input of several million cubic yards of dredged material.

28. The following plans were considered for disposal of dredged material from Hampton Roads (refer to Figure):

- Raising the existing levees at Craney Island.

- Westward extension of the existing Craney Island with levees to 17 feet msl.

- Westward extension of the existing Craney Island with levees to 29 feet msl.

- Willoughby Bay.

- Ocean View Area.

- Hampton flats.

- Ragged Island.

- Horseshoe Area off Buckroe Beach.

- Chesapeake Bay.

- Nansemond County.

- Disposal at sea.

- Truck haul to abandoned borrow pits.

- Inland disposal by rail haul.

- Do nothing.

29. Table 2 summarizes the major features of the 14 plan alternatives studies plus two additional alternatives for at-sea disposal.

DREDGED MATERIAL RESEARCH PROGRAM

30. The Dredged Material Research Program (DMRP) was administered by the Corps of Engineers Waterways Experiment Station and is essentially complete. It was a 5 year program authorized to address the questions of why and under what circumstances does the disposal of dredged material produce adverse environmental impacts. To date, it has produced more than 100 technical reports that have been widely distributed within and outside the Corps of Engineers. Among these are reports that address the dynamics of open water disposal, the management of containment facilities, and the possible beneficial uses for dredged material. A summary of the results of this program is presented in this section.

OPEN WATER DISPOSAL

31. With few exceptions, the physical effects--the logical and easily predicted physical effects--are more important than chemical or biological effects. By physical effects, it is meant the smothering of a clam bed, the disruption of a flow pattern, a change in salinity, or a similar effect. These possible consequences of disposal operations are persistent, often irreversible, and compounding. However, they are infrequent and can be avoided with the judicious application of available evaluative procedures. The DMRP has achieved results from theoretical, laboratory, and field investigations in inland and coastal waters that soundly substantiate that most fears over the short-term release of contaminants to the disposal site waters are unfounded. As long as the geochemical environment is not basically changed, as

TABLE 2

Comparison of Alternatives for Dredged Material Disposal for Hampton Road Harbor

Alternative	(1) Unit cost per c.y.	(2) Useful life(yrs)	(3) Major commitment of resources	(4) Major advantage	(5) Major disadvantage	(6) Further action recommended	Rationale for further action(a)(b)
A- Raise existing levee	1.05	11	No additional land	Cost/convenience	Short life	Detailed study	1,3,4 over 5
B- Westward extension	1.30	30	2,380 acres of marine bottom	Cost/convenience	Social impact	Detailed study	1,2,4 over 5,3
C- Westward extension, raised	1.05	12	No additional land	Cost/convenience	Social impact	Detailed study	1,3,4 over 5
D- Willoughby Bay	1.40	16	1,300 acres of marine bottom	Cost	Short life/severe social impact	None	5,3,2 over 4
E- Ocean View	2.20	79	4,500 acres of marine bottom	Useful life	Operational inconvenience/cost/social impact	None	3,1,5 over 4
F- Hampton Flats	1.90	24	1,800 acres of marine bottom	Convenience	Cause adverse circulation of currents & sedimentation	None	5,3 over 4
G- Ragged Island	1.80	17	2,300 acres of wetland	Cost	Resource Commitment Req'd	None	5 over 4
H- Buckroe Beach	2.70	89	6,100 acres of marine bottom	Useful life	Need model testing	Detailed study	5,4 over 3,1
I- Chesapeake Bay	3.00	57	2,980 acres of marine bottom	Useful life accessibility	Need model testing/cost	Detailed study	5,4 over 1,3(c)
J- Nansemond	2.20	63	5,000 acres of swamp forest habitat	Useful life/convenience	Potential for saline contamination of ground water aquifer	Detailed study	4 over 5,3
K- Sea by hopper dredge	2.90	Unlimited	None	Useful life	Need testing for possible adverse effects on marine environment	Detailed study	4,5,3 over 1
L- Sea by barge from Craney Island	3.00	Unlimited	None	Useful life	Need testing for possible adverse effects on marine environment	Detailed study	4,5,3 over 1
M- Sea by pipeline	2.60	Unlimited	None	Useful life	Need testing for possible adverse effects on marine environment	Detailed study	4,5,3 over 1
N- Sea by special Dredge	1.70	Unlimited	None	Useful life	Need testing for possible adverse effects on marine environment	Detailed study	4,5,1,3
O- Truck haul to abandoned borrow pits	3.20	Short life (d)	None	Reclamation of borrow pit	Useful life/Potential for saline contamination of ground water aquifer	None	5,1 over 4
P- Inland disposal by rail haul	4.10	50(e)	None	Reclamation of strip mines/useful life	Cost/Potential for saline contamination of ground water aquifer	None	1,5 over 2,4
Q- Do nothing	0	Unlimited	None	No resource commitment	Increase unit shipping costs/jeopardize national defense posture	None	5 over 4,3

(a) Numbers represent the parameter for each alternative; i.e. No. 4 represents "Major Advantage."
(b) Numbers in "Rationale" appear in order of weight influencing decision.
(c) This plan was originally rejected for reasons of cost and likely disruption of current movements within Chesapeake Bay. Since it can be made model tested when the Chesapeake Bay Model is completed, this plan was retained for further study at the request of the Commonwealth of Virginia.
(d) A useful life of 50 years was assumed for costing purposes. In reality, total useful capacity within a reasonable driving distance is small.
(e) 50-year life assumed for costing purposes.

is the case with open water disposal, most contaminants are not released from the sediment particles to the water. Some nutrients such as ammonium and manganese and iron are released, but in most cases, enough mixing is present to rapidly dilute these to harmless concentrations.

CONFINED DISPOSAL

32. Next to open water disposal, confined containment of dredged material as a conventional alternative has been the most extensively investigated under the DMRP. Confining contaminated material on land or in shallow water next to land can be an environmentally sound and preferred alternative, but not inherently better than open water disposal. If a confined disposal site is to be effective from an environmental protection standpoint, it must be efficient in retaining a high percentage of the finer soil particles for it is the clays and silts that carry the contaminants. These are admittedly the materials most difficult to retain in an area, but if they can be, the effluents should be essentially nontoxic except for occasional situations where nutrient levels and oxygen depletion may be excessive. However, there are cases where sites are simply incapable of providing adequate retention. Addressing these situations, DMRP studies have found that coagulants and flocculents can be quite effective for effluent treatment, and treatment system design and operation guidelines are being developed based on actual field tests.

33. In terms of time, effort, and cost, the most expensive aspect of confined dredged material disposal can be the land acquisition. Moreover, available land certainly will continue to become scarcer and scarcer. The DMRP has included studies aimed at alleviating or lessening this problem. These have dealt with methods to increase the storage capacity of existing sites and/or concepts for making existing sites reusable. Extensive DMRP field tests have proven that it is possible to dewater even some of the more difficult types of dredged material so that disposal sites can store more sediment and less water. A side benefit of this dewatering is improved engineering characteristics of the densified material.

BENEFICIAL USE OF DREDGED MATERIAL

34. Dredged material, particularly dewatered dredged material, is not a substance without value for landfilling or in construction. Every cubic yard that can be removed from a containment area and used, donated, or sold offsite for any purpose is a cubic yard of new storage capacity gained. Numerous possibilities exist for separating and handling materials in a site and actual field situations have demonstrated that use is possible within the site for purposes such as haul road construction and dike raising. Dredged material is also a substance that can be used to create or improve wildlife habitat--examples of this already exist in nearly every Corps District in the country. Small islands created by dredged material disposal in inland waterways and coastal bays and estuaries are a special type of upland habitat development. Several regional surveys sponsored by the DMRP have shown that there are more than 2,000 of these Corps-built islands that have become extremely valuable wildlife habitat. In fact, a majority of the total U.S. population of several colonial nesting birds such as sea gulls, terns, and herons are dependent upon islands of this type for their survival.

35. Marsh creation using dredged material is now a proven, viable alternative that can be designed and implemented as reliably as any other alternative. Also, certain misconceptions about this alternative can be firmly dispelled. In particular, it can be easily demonstrated that marsh development does not necessarily eventually preclude the disposal of material from subsequent maintenance dredging projects. There are examples where phased marsh development, with or without other disposal alternatives, has been planned in such a way as to accommodate maintenance dredging for periods of 50 years or more. While marsh development is a field tested and proven alternative, it is not a simple one and it is not inexpensive. However, costwise, it is definitely with other alternatives and less expensive than some.

36. Another major part of the DMRP has been the development and testing of concepts for non-wildlife oriented beneficial or productive uses of either dredged material itself or disposal sites. The DMRP found that, perhaps more than in any other alternative, successful use of the material or the sites as a natural resource requires favorable and often fortuitous circumstances, but these do occur. Non-technical factors outweigh technical ones more as a rule than as an exception and requirements for coordination and cooperation in land use planning are exceptional. Many products such as aggregate and bricks have been made using dredged material, sometimes successfully, and the potential for new concepts is unlimited. However, very few are likely to ever succeed in view of the quality and undependability of the supply of the raw material, the requirements for capital investment, and especially the need for favorable market conditions. The only concept with apparent potential for at least regional application field tested by the DMRP was the use of conventional disposal sites for the mariculture of shrimp.

37. Considering productive uses of dredged material, the DMRP has not overlooked the value of the land created when a disposal site reaches capacity. Most disposal sites filled with the fine-grained materials from maintenance dredging are not suitable for industrial or commerical development from a foundation engineering point of view, but they can be ideally suited for recreational development. While it is not the present policy of the Corps to expand its role in recreation to include navigation projects, there is a need for recreational facilities in this context and many non-Federal groups are interested. One DMRP study has pointed out the issues related to such use of disposal sites, including funding available, maintenance responsibility, and guarantees of public land use. Another has analyzed case histories in an attempt to find out why certain productive land uses have succeeded and others have failed. These include but are not limited just to recreational uses. Other studies are evaluating laws and regulations at all levels impacting on land uses and are determining the land values and associated benefits created by disposal sites.

OCEAN DISPOSAL

38. Disposal of materials dredged from the Chesapeake Bay into the ocean environmental has occurred in the past at several locations. Environmental Protection Agency ocean dumping regulations and criteria promulgated January 11, 1977, however, identified one of these previously utilized areas, i.e., Dam Neck, as the interim ocean dumping site for this geographic area. Interim sites such as Dam Neck were to remain valid for a period not to exceed 3 years from promulgation pending completion of baseline or trend assessment surveys and designation for continuing

use or termination of use. The Dam Neck ocean disposal area was to be discontinued by January 1980, however, its use was extended by the EPA until approval of the current Norfolk ocean disposal site investigations have been completed. Currently, the EPA, NOAA, and the COE are cooperating in an ocean site designation program for the Chesapeake Bay region.

39. In discharging the Federal responsibility to assess the suitability of the disposal areas provided for the Baltimore Harbor Channels deepening, certain technical investigations were performed at these areas as well as at several additional sites. In all, one contained site, two wetland creation sites, one sand stockpiling site, one ocean disposal site, and five Bay open water disposal sites were examined. Evaluation of study data resulted in the rejection of two sites based on excessive transportation costs for one site, and probable adverse environmental impacts at the other site. Additionally, two sites studied in Maryland were not offered by the non-Federal sponsor, and the ocean disposal site pends designation by EPA (refer to Ocean Disposal, page 23). A summary of the evaluation program is contained in Table 3.

TABLE 3

DISPOSAL AREAS EVALUATION SUMMARY

SITE	LOCATION	FIGURE NUMBER	TYPE 1/	GDM INVESTIGATIONS 2/	STATUS	REMARKS
Hart & Miller Islands	Upper Chesapeake Bay (UCB)	L-4	Contained	None	Selected	Subject of EIS prepared for regulatory permit and identified by non-Federal sponsor.
Kent Island	UCB	None	Open water	1. Bulk chemical 2. Elutriate 3. Sediment type	Not offered by non-Fed. sponsor.	Historically utilized disposal area.
Patapsco River Neck	UCB	None	Open water	1. Bulk chemical 2. Elutriate 3. Sediment type	Not offered by non-Fed. sponsor.	Historically and currently utilized disposal area.
Smith Island	UCB	None	Wetland creation	1. Cultural recon 2. Feasibility analysis	Rejected	Rejected on basis of excessive transportation costs.
Tangier Island	Lower Chesapeake Bay (LCB)	L-2&3	Wetland creation	1. Cultural recon 2. Cultural survey 3. Feasiblity analysis	Not identified by non-Fed sponsor	Subject to Commonwealth of Virginia interest (refer to Section L). Excessive construction costs.
Rappahannock Shoal Deep	LCB	L-2	Open water	1. Bulk chemical 2. Elutriate 3. Sediment type 4. Cultural recon	Selected	Historically utilized disposal area.
Wolf Trap	LCB	L-1	Open water	1. Bulk chemical 2. Elutriate 3. Sediment type 4. Cultural recon 5. Cultural survey	Selected	Historically utilized disposal area.

TABLE 3 (continued)

DISPOSAL AREAS EVALUATION SUMMARY

SITE	LOCATION	FIGURE NUMBER	TYPE 1/	GDM INVESTIGATIONS 2/	STATUS	REMARKS
Cape Charles Deep (or Old Plantation Flats)	LCB	None	Open water	1. Bulk chemical 2. Elutriate 3. Sediment type 4. Cultural recon 5. Biological survey	Rejected	Results of biological survey indicate relatively high diversity and abundance of fish and invertebrate species. Community was additionally evaluated as highly susceptible to disposal impacts.
Fort Story	Virginia Beach Virginia	None	Stockpile	Literature review	Standby	Subject to participation by non-Federal interest (refer to Section L).
Dam Neck	Atlantic Ocean	L-1	Open water	1. Bulk chemical 2. Elutriate 3. Sediment type 4. Cultural recon	Undetermined	Interim ocean disposal site designation expires Jan 80. This or other site to be designated by EPA in the future. Refer to Section K for details.
Norfolk	Atlantic Ocean	L-1	Open water	Literature review	Standby	Ocean disposal site designated by EPA and the Norfolk District, Corps of Engineers.

1/ Wetland creation sites were investigated under the authority of Section 150 of the Water Resources Development Act of 1976. This authority is subject to a limit of $400,000 per site and assumes that benefits are equal to costs. Refer to Section L for more detailed discussion.

2/ Bulk chemical, elutriate, and sediment type investigations may be found in Appendix D of the GDM; refer to Section K for cultural reconnaissance and survey discussions; refer to Section L for wetland creation feasibility analysis and stockpiling discussions.

FINAL

ENVIRONMENTAL IMPACT STATEMENT

Proposed Plan for Deepening the Existing Baltimore Harbor and Channels Project, Maryland and Virginia.

The responsible lead agency is the U.S. Army Engineer District, Baltimore.

Abstract: The Baltimore District has investigated public concerns to deepen the existing channels and approaches to Baltimore Harbor to meet the existing and prospective needs of navigation. Since the depth for the channel has been determined, only alternative locations and methods for placement dredged material were investigated.

The project consists of dredging in Maryland and Virginia waters. The dredged material from the Maryland channels will be placed in a confined disposal site in the Bay, therefore the disposal alternatives are limited to dredging of the Virginia Channels. Methods of placement of dredged material consist of wetland creation, stockpiling, placing overboard in the ocean, placing overboard in the bay, or any combination. The selected disposal method is a combination of placing material overboard in the ocean and bay with selected material to be stockpiled for beneficial reuse.

If you would like further information on this statement, please contact:
Mr. Robert N. Blama
U.S. Army Engineer District, Baltimore
P.O. Box 1715
Baltimore, Maryland 21203
Commercial Telephone: (301) 962-2558
FTS Telephone: 922-2558

NOTE: Information, displays, maps, etc. discussed in the Baltimore Harbor and Channels, Maryland and Virginia Main Report are incorporated by reference in the EIS.

SUMMARY

Major Conclusions and Findings

The Baltimore Harbor and Channels, Maryland and Virginia (50' project) was authorized by Congress in 1970 on the basis of a Review Report completed in June 1969. The June 1969 Review Report developed costs and benefits for increasing channel depths from 42 to 50 feet in the main channel and to various other depths in the side channels. Benefits were maximized for the main channel at the 50 foot depth. Advanced Engineering and Design studies (AE&D) were initiated in 1976 to affirm the need for the study, update costs and benefits and accomplish engineering and design of the project sufficient to support Congressional funding for construction. Since this is an affirmation study, no additional depths have been investigated, however various locations and methods for placement of dredged material have been further defined.

Material from the Maryland channels will be placed in the confined Hart-Miller Island site. The three Virginia channels in the bay to be dredged are the Cape Henry Channel, near the confluence of the bay and the ocean, the York Spit Channel near the York River and the Rappahannock Shoal Channel near the Rappahannock River. Disposal options under consideration for Virginia channels were wetland creation at Smith and/or Tangier Islands in the Chesapeake Bay, stockpiling sand at Fort Story near Virginia Beach, and various ocean and bay disposal areas.

Material from the Cape Henry Channel will be placed at the proposed Norfolk District Corps of Engineer's designated Norfolk Ocean Site about 17 miles offshore or at the existing ocean site (Dam Neck). Placement in either ocean site was chosen due to the close proximity of the channel and these sites. Selected material suitable for beneficial reuse will be placed from this channel at Fort Story. Material from the York Spit Channel will be placed overboard in the Wolf Trap disposal site located about 3 miles northwest of the channel. This site was chosen due to the close proximity to the channel and since this is a currently used disposal area. The dredging in the Rappahannock Shoal Channel will be placed overboard in the Rappahannock Shoal disposal area located about 8 miles northwest of the channel. Similarily, this site was chosen for its closeness to the channel and its previous use as an area for placement of dredged material.

Wetlands will not be eliminated during dredging or deposition of the dredged material with implementation of the project and the project is therefore in compliance with EO 11990, Protection of Wetlands. A 404(b)(1) evaluation was performed and concluded that no major adverse environmental impacts would occur from the placement of dredged material. Also, since plan implementation will not occur within the 100-year floodplain, the proposed project is in compliance with EO 11988 Floodplain Management.

Areas of Controversy

One area of controversy during the planning process, although not as a part of the authorized deepening project, was the use of Hart-Miller Islands, by Maryland, as a site for placing material dredged from the Maryland portion of the project. An environmental impact statement concerning the permit for Hart-Miller Island containment area was filed by the Corps of Engineers with EPA in 1974 and a permit was granted in 1976 to construct the site. Opponents to the containment area claimed the Environmental Impact Statement was inadequate and the permit was improperly issued since the structure that would contain the fill would require congressional approval under the Rivers and Harbors Act of 1899. A Federal district court ruled that the Corps erred in issuing the permit, however, the 3rd U.S. Circuit Court of Appeals reversed that decision. The case was appealed to the Supreme Court which declined to hear the arguments on 17 November 1980, thereby letting the Appeals Court decision stand and requiring the District Court to decide the remaining issues. The District Court ruled on these issues 24 December 1980 in favor of the government. Subsequently, Maryland has reiterated its assurances and restated that the disposal site for dredged material in Maryland is Hart-Miller Islands.

Unresolved Issues

There are no major unresolved issues concerning the Baltimore Harbor and Channels project at this time.

Relationship to Environmental Requirements

Certain environmental requirements, executive orders, and other policies of the Federal, State, or local governments must be met in order to implement the project. Table EIS-1 presents these concerns and their relationship to various aspects of the plans.

TABLE - EIS 1

RELATIONSHIP OF PLAN TO ENVIRONMENTAL REQUIREMENTS

Federal Statutes	Proposed Plan
Archeological and Historical Preservation Act, as amended	Full Compliance
Clean Air Act, as amended	Full Compliance
Clean Water Act of 1977	Full Compliance
Coastal Zone Management Act of 1972, as amended	Full Compliance
Endangered Species Act of 1973, as amended	Full Compliance
Estuary Protection Act	Full Compliance
Federal Water Project Recreation Act, as amended	N/A
Land and Water Conservation Fund Act, as amended	N/A
Fish and Wildlife Coordination Act	Full Compliance
Marine Protection, Research and Sanctuaries Act	Full Compliance
National Historic Preservation Act, as amended	Full Compliance
National Environment Policy Act as amended	Full Compliance
Rivers and Harbors Act	Full Compliance
Watershed Protection and Flood Prevention Act	N/A

Wild and Scenic Rivers Act, as amended	N/A
Executive Orders, Memorandum, etc.	
EO 11988 Floodplain Management	Full Compliance
EO 11990 Protection of Wetlands	Full Compliance
EO 12114 Environmental Effects of Major Federal Actions	Full Compliance
Analysis of Impacts on Prime and Unique Farmlands	N/A
<u>State and Local Policies</u>	
Coastal Area Management Amendments 1974	Full Compliance

NOTES: - The compliance categories used in this table were assigned based on the following definitions:

Full - All requirements of the statute, E.O., or other policy and related regulations have been met.
Partial - Some requirements of the statute, E.O., or other policy and related regulations remain to be met.
Noncompliance - None of the requirements of the statute, E.O., or other policy and related regulations have been met.
N/A - Statute, E.O., or other policy not applicable.

BALTIMORE HARBOR AND CHANNELS, MARYLAND AND VIRGINIA

FINAL ENVIRONMENTAL IMPACT STATEMENT

TABLE OF CONTENTS

1. NEEDS AND OBJECTIVES OF ACTION

a. Study Authority

1.01 The Baltimore Harbor and Channels Maryland and Virginia project modification, were authorized by Section 101 of the River and Harbor Act, dated 31 December 1970, Public Law 91-611, which states:

> "The following works of improvements of rivers and harbors...are hereby adopted and authorized to be prosecuted by the Secretary of the Army, acting through the Chief of Engineers, in accordance with the plans and subject to the conditions recommended by the Chief of Engineers in the respective reports hereinafter designated.
>
> Baltimore Harbor and Channels, Maryland and Virginia: Chief of Engineers report dated September 21, 1970, except that not to exceed $40,000,000 is authorized for initiation and partial accomplishment of such project, and except that construction shall not be initiated until approved by the Secretary of the Army and the President."

1.02 The existing project for Baltimore Harbor and Channels was adopted by the River and Harbor Act approved 8 August 1917 and provided for additions to the project existing at that time and for the inclusion of all Federal river and harbor works in the Patapsco River, its tributaries, and approaches into one project. Adopted by the Act of 1917, and modified by the River and Harbor Acts approved 21 January 1927, 3 July 1930, 17 October 1940, 2 March 1945, and 3 July 1958. The authorized project as of 1958 consisted of:

(1) A uniform main channel 42 feet deep, between the Virginia Capes and Fort McHenry at Baltimore, Maryland, with dimensions as follows:

(a) Cape Henry Channel: 42 feet deep and 1,000 feet wide from the 42-foot depth curve in the Atlantic Ocean to that depth in Chesapeake Bay, a distance of 1.0 miles.

(b) York Spit Channel: 42 feet deep and 1,000 feet wide connecting the 42-foot depth curves in Chesapeake Bay near York Spit, a distance of 10.4 miles.

(c) Rappahannock Shoal Channel: 42 feet deep and 800 feet wide connecting the 42-foot depth curves in the Chesapeake Bay opposite the Rappahannock River, a distance of 5.3 miles.

(d) Baltimore Harbor Approach Channels: 42 feet deep and generally 800 feet wide, widened at the approach and bends, from the 42-foot depth curve in Chesapeake Bay opposite the mouth of the Magothy River to Fort McHenry on the Patapsco River, a distance of about 20 miles.

(2) Branch channels with dimensions as follows:

(a) Connecting Channel to Cheseapeake and Delaware Canal Approach Channel: 35 feet deep, 600 feet wide, and 13.0 miles long from the Cutoff-Brewerton Angle in the main channel to the 35-foot depth curves in the natural channel on the east side of Chesapeake Bay which is part of the inland waterway from Delaware River to Chesapeake Bay. The channel includes the Brewerton Extension and Swan Point and Tolchester Sections.

(b) Curtis Bay: 42 feet deep, 600 feet wide, and 2.2 miles long from the main channel to and including a turning basin at the head of Curtis Bay.

(c) Curtis Creek:

- A channel, 35 feet deep and 200 feet wide, from the 42-foot channel in Curtis Bay to 750 feet downstream of the Pennington Avenue Bridge.

- A channel, 22 feet deep and generally 200 feet wide, from the 35-foot channel to and along the marginal wharf of the Curtis Bay Ordnance Depot.

- An irregulary shaped, 3-acre basin, with a depth of 18 feet, adjacent to the head of the 22-foot channel.

- A basin, 15 feet deep and 450 feet wide, from the end of the 22-foot channel to the end of the marginal wharf.

- A channel, 22 feet deep and 200 feet wide, from the 22-foot channel south of the Baltimore and Ohio Railroad Bridge to the vicinity of Arundel Cove, a distance of 2,800 feet, thence 100 feet wide in Arundel Cove for a distance of 2,100 feet, with an anchorage basin, adjacent to the channel and southwest of the wharf of the Coast Guard Depot at Curtis Bay.

(d) Middle Branch:

- Ferry Bar East Section: A channel, 42 feet deep and 600 feet wide, from the main channel at Fort McHenry to Ferry Bar, a distance of 1.4 miles.

- Ferry Bar West Section: A channel, 35 feet deep and 400 feet wide, from the Ferry Bar East Section to Ferry Bar, a distance of 0.8 mile.

- Spring Garden Section: A channel, 27 feet deep and 250 feet wide, from Ferry Bar to and including a turning and anchorage basin immediately below the Western Maryland Railway Bridge, a distance of 1.0 miles.

(e) Northwest Branch:

- East Channel: 950 feet wide and 39 feet deep.

- West Channel: 650 feet wide and 35 feet deep.

- Federal maintenance of 39-foot or 35-foot deep channels after either depth has been provided by local interests.

(3) Anchorages with dimensions as follows:

(a) Riverview Anchorage No. 1: 35 feet deep, 4,500 feet long, and 1,500 feet wide.

(b) Riverview Anchorage No. 2: 30 feet deep and 2,400 feet long, and 1,200 feet wide.

(c) Fort McHenry Anchorage: 35 feet deep, 3,500 feet long, and 400 feet wide.

(d) Quarantine Anchorage: 3,500 feet long, 600 feet wide and 35 feet deep.

1.03 The 31 December 1970 authorized modification for Baltimore Harbor and Channels, as shown in Figures 1 through 3 provides for:

a. Deepening the Cape Henry Channel from 42 feet to 50 feet and extension to 50-foot depth curves.

b. Deepening the York Spit Channel from 42 feet to 50 feet and extension to 50-foot depth curves.

c. Deepening the Rappahannock Shoal Channel from 42 feet to 50 feet, widening from 800 feet to 1,000 feet, and extension to 50-foot depth curves.

d. Deepening the Main Ship Channel from 42 feet to 50 feet and extension to 50-foot depth curves.

e. Deepening the Curtis Bay Channel from 42 feet to 50 feet.

f. Deepening the Northwest Branch-East Channel to 49 feet deep and limiting the width to 600 feet, with a turning basin at the head of the channel from that depth existing at the time of construction.

g. Deepening the Northwest Branch-West Channel to 40 feet deep and limiting the width to 600 feet, with a turning basin at the head of the channel from that depth existing at the time of construction.

b. Public Concerns

1.04 Baltimore Harbor has historically ranked as one of the leading ports in the nation and the world both in terms of tonnage and dollar value. The rapid growth of international bulk trade during the past two decades and the concurrent expansion of the world bulk fleet, both in terms of number of vessels and their size, have led to a considerable expansion and improvement of port facilities worldwide. Most of this development has been directed towards providing deep water and cargo handling facilities to accommodate large bulk carriers safely and efficiently, such vessels offering the most efficient means of transporting large volumes of commodities. Currently, over seventy 100,000+ deadweight ton (DWT) terminals are scheduled to become operational. With current depth restrictions at Baltimore Harbor, the larger bulk carriers calling on the Port in increasing numbers every year cannot load to their capacity, making water transportation of Baltimore Harbor less efficient. As Baltimore Harbor is primarily a bulk cargo port, economical water transportation afforded by deep shipping channels is paramount in keeping Baltimore active and contributive to other United States and world ports.

1.05 The water depths in the ship channels in and leading to Baltimore Harbor are presently inadequate to accommodate the existing and future large bulk cargo carriers in the world fleet. Currently, a significant number of vessels in Baltimore Harbor's major bulk trades cannot load to capacity due to the 42-foot water depth restrictions. This situation is likely to worsen in the future as volumes of commerce at Baltimore and ship sizes in the world fleet increase. Further information may be found in Section F of the General Design Memorandum (GDM).

1.06 The public has expressed some concerns with the actual construction of the project. The type of dredging to be used and the resulting effect on the hydrologic salinity and water quality regimes have been identified as problems. The identification of Hart-Miller as the site for placement of dredged material, the safety of the containment site and effects upon water quality from the Hart-Miller containment area have been areas the public has expressed concern about.

c. Planning Objectives

1.07 Prior to initiation of the General Design Memorandum (GDM), the findings of the most recent investigations of the project were contained in the Review Report, Baltimore Harbor and Channels, June 1969, which was subsequently supplemented by a report entitled, Baltimore Harbor and Channels, Maryland and Virginia - Supplemental Information Requested by the Office of Management and Budget to June 1969 Review Report, 19 July 1974. The purpose of these prior reports was to evaluate the need for, and advisability of, deepening the existing channels and approaches to Baltimore Harbor in order to meet the existing and prospective needs of navigation.

1.08 The purpose of the GDM (an advanced engineering and design document) is to affirm the authorized plan of improvement; taking into account environmental and technical considerations, economic feasibility, social impact, public involvement; and refine the design, construction schedule, and operation/maintenance plan for the authorized improvements.

2. ALTERNATIVES

a. Plans Eliminated From Further Study

2.01 The June 1969 Review Report considered plans of improvement for channels ranging from 43 feet to 50 feet. Economic studies were undertaken to determine potential transportation savings to shippers resulting from the use of larger, deeper-draft vessels in the ore, coal, petroleum, sugar, and general cargo trades. Benefits and costs were calculated for deepening to channel depths ranging from 42 to 50 feet in the main ship channels and the Curtis Bay Channel, from 35 to 50 feet in the Northwest Branch-East Channel and from 28 to 40 feet in the Northwest Branch-West Channel.

2.02 Benefits for deepening the main channels, including the Northwest Branch-East Channel, from 42 feet were maximized between 49 and 50 feet (See Table H-2 Main Report). Fifty feet was the selected optimum depth, with a corresponding benefit-cost ratio of 1.26 to 1. The Northwest Branch-East Channel was selected for a depth of 49 feet since no additional benefits accrued for 50 feet. Net benefits from deepening the Northwest Branch-West Channel from 28 feet were maximized to 40 feet, with a corresponding benefit-cost ratio of 26.9 to 1.

2.03 The 1974 Supplement to the Project Document, presented an updated economic analysis for the project and evaluated the feasibility of deepening only the inbound portion of the channels to 50 feet. Although the inbound-only channel was found to have a higher benefit-cost ratio, the 50-foot inbound and outbound channel was recommended due to safety reasons.

2.04 The Middle Branch of the Patapsco River, which consists of Ferry Bar East, Ferry Bar West and Spring Garden channels, will remain at present depths and not be deepened. Increasing the depth in these channels was not recommended since the local interests did not express an interest in deepening these channels because the type of vessels utilizing the channels do not require increased depths.

2.05 Consideration was given for increased anchorages in the Patapsco River, however in view of modern communication systems and the availability of deep water south of the William Preston Lane, Jr. Memorial Bridge, it was found that additional anchorages facilities were not needed. The area south of the bridge is currently used as an anchorage and modern communications make it possible for ships to leave this anchorage and arrive at a berth when it is vacant with practically no delay.

b. No Action

2.06 Without the implementation of the authorized improvements for the Baltimore Harbor channels the maximum draft of vessel using the port would be limited to the draft now accommodated. Constriction of larger ships in bulk trade fleet and improvements to other United States and foreign ports to accommodate larger ships could reduce the economic efficiency of the port and this region, particularly in the area of bulk commodities. A very high percentage of the port's commerce consists of bulk commodities which are moved most efficiently in large carriers, and the trend towards such carriers is clearly evident in the Port of Baltimore.

2.07 Use of large carriers at the Port of Baltimore will require the inefficiencies and economic disadvantages of light-loading to insure safe navigation. As the Port is Maryland's single most important economic asset loss of commerce would have a significant effect on the State's economic and social well-being.

c. Plans Considered in Detail

2.08 Since this study is an affirmation of the authorized plan of improvement, no additional plans were considered. The plan considered in detail in this study is the authorized modification for Baltimore Harbor and Channels as described previously.

2.09 Deepening the existing Federal channels and approaches to the Port of Baltimore involves the dredging and placement of approximately 71.8 million cubic yards (mcy) of material. The navigation improvements to the channels in Maryland waters requires the dredging and disposal of about 41.2 mcy of material while deepening the Virginia channels involves dredging and deposition of about 30.6 mcy of material.

2.10 In addition, non-Federal interests have to agree to deepen any private channels, at their own expense, which would lead to the Federal channel. The estimated quantity of material from private channels is 2.5 mcy of material (1981) at a cost of $10.5 million dollars (1981 price levels).

2.11 Following authorization of the project (1970), plans for placement of the dredged material have proceeded, both prior to and during the course of the General Design Memorandum (GDM). The project document reflects a requirement that non-Federal interests identify and provide all lands, easements and rights-of-way required for construction and subsequent maintenance, including suitable areas for initial and subsequent disposal of dredged material and any necessary retaining dikes. Areas considered for placement of dredged material are presented as follows:

HART-MILLER

2.12 In order to provide for an acceptable disposal area, the State of Maryland initiated a study which looked for adequate areas in the bay for placement of dredged material. Among approximately 70 different sites which were studied, the State identified Hart-Miller Islands as the most suitable site. (See Figure L-4). Consideration was given from an engineering, economic, and ecological perspective. Opposition to the use of Hart-Miller resulted in lengthy litigation (see Areas of Controversy, page EIS-2). The use of this area for placement of dredged material from the Maryland channels has been reconfirmed by the State of Maryland.

2.13 Dredged material placement for the Virginia channels has been further studied in Advanced Engineering and Design (AE&D). Plans which have been studied in some detail include overboard disposal, stockpiling, and wetland creation. In the Virginia section of the project, the dredged material will be placed overboard in various sites. The York Spit material will be placed overboard in the Wolf Trap Disposal site (Figure L-1), and Rappahannock Shoal material be placed in the Rappahannock Shoal Disposal site (Figure L-2). The Cape Henry material be placed, at the Norfolk Disposal site in the ocean, (Figure L-5), or at the existing ocean site (Dam Neck). Also, suitable material from the Cape Henry channel will be placed at Fort Story for beneficial uses. Besides these disposal areas, other sites were considered for disposal and are as follows:

CAPE CHARLES

2.14 Cape Charles, also known as Old Plantation Flats is a deep trench lying within a long trough. The salinities in this area range from 24.0 - 29.3 ppt and have depths down to 155 feet. This site is located west of Cape Charles City and has never been used as a disposal site. Results of Biological surveys indicate relatively high diversity and abundance of fish and invertebrates. This site also includes a number of exotic or incidental species (i.e. two species of coral). The biological community was additionally evaluated as highly susceptible to disposal impacts. For these reasons, this site was eliminated from further study.

TANGIER ISLAND

2.15 Tangier Island is the most southerly of a series of marshy islands separating Chesapeake Bay and Tangier Sound. It is located about 65 miles north of Norfolk, Virginia, and 15 miles southwest of Crisfield, Maryland. The island is about 5 miles long and 1.5 miles wide. The western shore of the island is undergoing erosion problem with the shoreline receding approximately 20 feet per year.

SMITH ISLAND

2.16 Smith Island is also a marsh island separating Chesapeake Bay and Tangier Sound. It is located about 10 miles west of Crisfield, Maryland (Figure L-2). The island is approximately 8 miles long and 4 miles wide. As with Tangier Island, the western shore of Smith Island is undergoing severe erosion with the shoreline receding about 8 feet per year. Biological surveys by the U.S. Fish and Wildlife Service in 1978 showed the benthic fauna in the area of erosion as quite limited. However, due to excessive transportation costs, this site was rejected.

2.17 Further information on the type, status, and studies performed on these areas may be found in Table I-4 of the main report.

2.18 It is clear that selection of locations of dredged material sites are greatly influenced by economic costs of transporting and placing dredged material. The plan of using the Norfolk Disposal Site for Cape Henry material, the Wolf Trap site for York Spit material and Rappahannock Shoal site for the Rappahannock Shoal Channel material is the most cost effective. Taking all the dredged material to the Norfolk Disposal Site, while it would eliminate any impacts from placement of material in the Bay, would be much more expensive.

d. Comparative Impacts of Alternatives

2.19 Impacts on significant resources and plan economic characteristics are displayed in Table EIS-2. Since the Old Plantation Flats site was eliminated for environmental concerns and detailed costs were not developed, it is not displayed in the table.

3. AFFECTED ENVIRONMENT

a. Environmental Conditions

GENERAL DESCRIPTION

3.01 Chesapeake Bay is the largest estuary on the Atlantic Coast of the United Staes and it lies entirely within the Atlantic Coastal Plain. Its main axis is oriented in a north-south direction, roughly parallel to the Atlantic Coast. It has a free connection with the waters of the Atlantic Ocean at its southern extreme. The tidal shore line is about 4,600 miles in length, of which 3,400 miles are in Maryland and 1,200 miles in Virginia. The

TABLE - EIS-2

Comparative Impacts of Alternatives

Disposal Sites	Effects on Fin and Shellfish	Cultural Resources	Amount of Material Site Can Accommodate	Wetlands	Economics
Rappahannock Shoal	Minor, Temporary	None	All material from Rappahannock Shoal Channel.	N/A	
Wolf Trap	Minor, Temporary	None	All material from York Spit Channel.	N/A	
Norfolk Site	Minor, Temporary	None	All material from all channels.	N/A	
Dam Neck	Minor, Temporary	None	Material from Cape Henry Channel.	N/A	
Fort Story	N/A	N/A	About 500,000 to 750,000 cy of sand from the Cape Henry Channel.	N/A	
Tangier Island	Minor, Temporary	None	About 15,000 cy of sand from the Rappahannock Shoal Channel.	Will be created.	

Bay is about 200 miles in length and varies in width from 4 miles near Annapolis and the William Preston Lane, Jr. Memorial Bridge to about 30 miles at its widest point near the mouth of the Potomac River.

3.02 The Bay proper has a mean depth of less than 28 feet; the entire system including tributaries to the head of tide, averages about 21 feet deep. There are deep areas which occur as long narrow troughs. These troughs are thought to be remnants of the ancient Susquehanna River valley which have not been filled by post-Pleistocene sediments. The deepest of these holes (about 174 feet) occurs off Kent Island where the Bay is at its narrowest. Additionally, many navigation channels lead to Baltimore (42 feet with Congressional authorization to deepen to 50 feet), and to Hampton Roads, near Norfolk, Virginia (45 feet).

REGIONAL GEOLOGY

3.03 The Coastal Plain in the Cheseapeake Bay region is underlain by a thick, wedge-shaped series of sedimentary formations which strike northeast and dip gently toward the southeast. These "soft" rocks are composed of mostly unconsolidated beds of sands, clays, marls, and gravels, which range from Lower Cretaceous to Recent in age. The thin edge of the wedge lies along the inner westernmost portion of the Coastal Plain while the thick portion underlies the Atlantic Coast where information from deep drilling in the vicinity of Ocean City, Maryland, shows the Coastal Plain sediments to be in excess of 7,500 feet thick. The basement upon which these sedimentary formations rest is composed of very ancient, predominantly pre-Cambrian, crystalline rocks upon which a prolonged pre-Cretaceous erosion cycle produced a peneplained surface. Along the inner edge of the Coastal Plain the crystalline rocks emerge from beneath the overlapping unconsolidated formations along a line of demarcation known as the "Fall Line" which marks the head of navigation on such major tributaries to Chesapeake Bay as the Patapsco River at Baltimore, the Potomac River at Washington, and the Rappahannock River at Fredericksburg, Virginia. The Fall Line also marks a topographic change westward, from the flat or gently rolling low elevations of the Coastal Plain to the higher elevated, bolder relief of the Piedmont Plateau.

HYDRODYNAMIC AND HYDROLOGIC CHARACTERISTICS

3.04 Chesapeake Bay is a complex, dynamic system. The ebb and flood of the tides and the incessant action of the waves are the most readily perceptible water movements in the Bay. The mean tidal fluctuation in Chesapeake Bay is small, generally between 1 and 2 feet. The mean range of tide is 2.8 feet at the Cape Henry Channel, 2.3 feet at the York Spit Channel, 1.4 feet at the Rappahannock Shoal Channel, 0.8 foot at the Craighill Entrance, 0.9 foot in the Cutoff Section, 1.1 feet at Fort McHenry, and 1.2 feet at Poole's Island in the upper Chesapeake Bay. Fluctuations in the water surface elevation in Baltimore Harbor caused by lunar tides are insignificant when compared with fluctuations from weather conditions. Average maximum tidal currents range from 0.5 knots to over 2 knots (1 knot equals 1 nautical miles or 6,076 feet per hour). Except during periods of unusually high winds, waves in the Bay are relatively small, generally less than 3 feet in height. The mixing in the estuary of sea water and freshwater creates salinity variations within the system. In Chesapeake Bay, salinities range from 33 parts per thousand at the mouth of the Bay near the ocean to near zero at the north end of the Bay and at the heads of the embayments tributary to the Bay. Generally speaking, the annual temperature range in Chesapeake Bay is between 0 degrees Centigrade and 29 degrees Centigrade. Because the mouth of the estuary is close to the sea, it has a relatively stable temperature as compared with the upper reaches. Dissolved oxygen levels vary considerably both seasonally and according to depth. During the winter, the Bay is high in dissolved oxygen content. With spring and higher water temperatures, the dissolved oxygen content decreases. While warmer surface waters stay near saturation, in deeper waters the dissolved oxygen content becomes significantly less. Through the summer, the waters below 30 feet become oxygen deficient.

WATER QUALITY

3.05 Water quality conditions in the Chesapeake Bay Area vary widely due to a variety of factors, e.g., proximity to urban areas, type and extent of industrial activity, . streamflow characteristics, amount and type of upstream land and water usage. A blanket statement would probably conclude that the water quality of the Bay itself is good, with most of the severe problems occurring in the tributaries especially near areas of high population concentrations.

ECOLOGY

Finfish and Shellfish

3.06 The Chesapeake Bay serves as a nursery and spawning ground for fish of both sport and commercial importance. The most productive Bay waters are located in areas of low salinity in the Upper Bay and corresponding portions of the major tributaries. The northern part of the Chesapeake Bay, including the C&D Canal, is probably the largest of all spawning areas in the Bay. This area plus the upper tidal portions of the Potomac, York, Rappahannock, James, and Patuxent Rivers, represent about 90 percent of the anadromous fish spawning grounds. The utilization of Baltimore Harbor as spawning habitat is very limited. The Harbor is, however, used as a nursery and feeding ground by several fish species, white perch being the most abundant.

3.07 The most economically important species of shellfish are the oyster, blue crab and the softshell clam. Virginia is the nation's leading producer of blue crabs and Maryland leads the nation in the production of softshell clams and oysters.

Waterfowl

3.08 The numerous productive areas located around the Bay are valuable as feeding and resting areas for the numerous flocks of ducks and geese that travel the Atlantic Flyway. Also, the abundance of upland areas scattered around the Bay is valuable for the development of nesting colonies as well as an area for resident and migrating songbirds.

b. Significant Resources

HYDRODYNAMIC AND HYDROLOGIC CHARACTERISTICS

Salinity

3.09 The salinity of Chesapeake Bay ranges from slightly below that of the open ocean at the Virginia Capes to freshwater at the Susquehanna flats in the upper bay. At Baltimore, the surface salinity varies from an average of 5 parts per thousand in the fall. At the mouth of the Potomac River the surface salinity varies from 11 to 18 parts per thousand, while at Cape Henry it varies from 23 to 29 parts per thousand.

3.10 Within the Bay proper, and its major tributaries, there is super-imposed on the tidal currents a less obvious, non-tidal, two layered circulation pattern that provides a net seaward flow of lighter, lower salinity water in the upper layer and a flow up the estuary of heavier, higher salinity waters in the deeper layer. The tidal currents provide some of the energy necessary for the mixing of the two layers.

3.11 The Baltimore Harbor Channels in Maryland are located in the mesoholine ecological zone (5-18 ppt salinity) near its transition with the oligohaline (0.5-5 ppt salinity) zone. There is a longitudinal salinity gradient which may undergo significant variations dependent on the amount of freshwater inflow from the Susquehanna River. During periods of high freshwater inflow the salinity at the Patapsco River and the Bay Bridge may be 3 ppt and 6 ppt respectively. During dry periods the salinity may increase to 8 ppt at the mouth of the Patapsco River to 13 ppt at the Bay Bridge.

3.12 The three Virginia channels are located in the polyhaline zone of the Bay (18-30 ppt salinity). This ranges from about 19 ppt at Rappahannock Shoal Channel to 30 ppt at Cape Henry. During periods of high freshwater inflow the salinities in the upper waters may drop as much as 5 ppt.

Currents

3.13 Average maximum tidal currents range from 0.5 knots to over 2.0 knots. The velocity of the flood current varies in strength from about 1.0 knot at the entrance to Chesapeake Bay to about 0.6 knots at the Craighill Entrance Channel. The velocity of the ebb current varies from about 1.5 knots at the entrance to the bay to 0.7 knots in the Craighill Entrance.

3.14 During 1972, the Virginia Institute of Marine Sciences (VIMS) performed an intensive sediment sampling and analysis study of the Baltimore Harbor Channels in Virginia under contract to the Norfolk District of the United States Army Corps of Engineers. The results of that study may be found in Appendix C. During 1977 and 1978, VIMS performed a similar study under contract to the Baltimore District (Appendix D). This later study included sampling in the new channel areas and potential overboard disposal areas - areas not investigated in 1972. While repeating parameters from the earlier study, new parameters were added by suggestion of the Technical Advisory Group. Both studies included surface sampling and sampling beyond project depth by vibracore borings. The 1978 study also included both deep and surface sampling from the project channels in Maryland, and elutriate analysis for all proposed overboard disposal areas.

WATER QUALITY

3.15 Water quality as a whole in Chesapeake Bay is considered good. In the upper portion of the Bay, nutrients carried by Susquehanna River waters, largely as a result of runoff from extensive fertilized agricultural areas and the wastewater discharges appear to be the major problem. Depression of dissolved oxygen (DO) concentrations below Conowingo Dam, located near the mouth of the Susquehanna River, following late summer deep water discharges, causes occasional fish kills.

3.16 In the Patapsco River and especially the Baltimore Harbor Area, analysis of the water quality has indicated that many sources of pollution exist. Among these are wastewater discharges, direct industrial discharges, sewerage overflows and leaks into the harbor tributaries, urban runoff, and spills of hazardous substances from vessels and dockside facilities. Major problems include low dissolved oxygen contents, high bacterial concentrations and undesirable levels of other pollutants such as heavy metals and oil. In the middle and lower Chesapeake Bay, water quality is good with most of the problems occurring in the tributaries and near areas of high population concentration.

3.17 Material to be dredged from project channels in Virginia have been found to contain low levels of all parameters tested when compared with guideline levels recommended by the Spoil Disposal Criteria Committee, a group established by the State of Maryland, to identify dredged material potentially unsuitable for overboard disposal. The Environmental Protection Agency, Region III, recognizes these guideline levels as reasonable and adequate when applied to placement of dredged materials in the waters of the Chesapeake Bay. Results of elutriate analyses performed for the dredging and disposal areas showed little affect upon ambient water quality.

3.18 Borings taken by Ocean/Siesmic/Survey, Incorporated, in 1977, indicate that soils in the Maryland channels are all hard or very compact silty to clayey sands. The interpretation of the generalized soils profile indicates that harbor bottom deposits of varying thickness are underlain by estaurine deposits across the width of the harbor. The harbor bottom deposits contain decomposed organics and petroleum residue, while the estuarine deposits are soft to stiff organic clayey silts or organic sandy silts. Underlying these materials is a stratum of compact to very compact silty sand to gravelly sand. Sediments in Maryland waters tested by VIMS during 1978 revealed the pattern demonstrated by a study of Baltimore Harbor sediments conducted by the Environmental Protection Agency during 1971, and by the yearly testing performed by Maryland Department of Natural Resources on the approach channels to the harbor prior to maintenance dredging. This pattern consists of a grossly polluted surface layer of sediments within the inner harbor, diminishing in level of contamination as the harbor mouth is approached, and finding sediments in the project channels in the Bay suitable for open water disposal.

ECOLOGY

3.19 Within the Bay, the three main sources of primary production are phytoplankton, submerged aquatic vegetation, and wetland vegetation. These are limited to relatively shallow areas where light can penetrate to the bottom. The Chesapeake Bay is one of the most highly productive estuarine systems in the world. The Bay serves as nursery and spawning grounds for a variety of different species.

3.20 Benthic invertebrates of the polyhaline zone in the lower Bay exhibit a high diversity and a distribution pattern which is largely determined by the patterns in bottom sediment type. The benthic invertebrates play an essential role in the aquatic food web by serving as food sources for a large variety of species in higher trophic levels. Among the invertebrates of particular interest are the commercially harvested species.

3.21 In the lower Bay, the largest commercial fishery is for blue crabs (Callinectes sapidus). Harvesting occurs on a year round basis and includes a winter dredging fleet. Female crabs migrate south during the late summer and fall to the higher salinity water's of the lower Bay. The adult females pass the winter in the deeper portion of the lower Bay, an area which includes the York Spit and Cape Henry channels. During the spring, the crabs move into shallower water, where they will spawn in late spring and summer. After hatching, the zoeae larval stage remains planktonic for about 6 weeks. The greatest concentrations of zoeae occur between Cape Charles and Cape Henry in the upper water levels in the vicinity of the channel, with lesser numbers up-Bay and seaward. As they pass through the megalops stage and into the young crab stage, they settle to the bottom and migrate up-Bay.

3.22 There is a very minor commercial fishery during the winter for rock crabs (Cancer irroratus). Rock crabs move into the lower Bay from the Ocean in mid-November and depart in April. They are found east of the Bay Bridge-Tunnel and the lower York Spit.

3.23 Commerical harvesting of hard clams (Mercenaria mercenaria) is centered primarily in the Bay tributaries. Although the clams occur throughout the lower Bay, their concentrations are apparently only high enough to support a modest commercial fishery there. There are likely to be scattered populations of hard clams in the Virginia channels, particularly in Cape Henry and York Spit and possibly in the disposal sites. The records of commercial harvest of soft clams from the Bay waters in the vicinity of the Baltimore approach channel are shown in Section 10. In general, most soft clams are found in waters less than 20 feet deep. Oysters (Crassostrea virginica) are abundant in many parts of the estuary and comprise an important commercial fishery in Maryland and Virginia. The numerous small bays, coves, and inlets between the Chester and Nanticoke Rivers along the Eastern Shore and the lower portions of the Patuxent, Potomac, York, Rappahannock, and James Rivers account for approximately 90 percent of the annual harvest of oysters in the Bay. Since oysters are most abundant in waters less than 25 feet deep and occur infrequently in waters greater than 35 feet deep, productive oyster bars are not located close to the Virginia channels or deep water disposal sites. Chartered oyster bars in the vicinity of the Baltimore approach channel are shown in Figures K-3 and K-4 of the main report. Although all these bars are open to public harvest, some are no longer productive.

3.24 In 1972, J. A. Musick (VIMS) listed about 285 species of fish known to occur in the Bay. A great majority of these species range in both the upper and lower reaches of the Bay. Some of the fish that use the Bay as a nursery include the striped bass, weakfish, shad, alewife, blueback herring, croaker, menhaden, and kingfish. A variety of prominent freshwater and marine finfish in the Bay include such species as the spot, seatrout, flounders, yellow perch, white perch, catfish, and sunfish. A large number of desirable sport fish species are found in the Bay at various times and places, with about a dozen being of principle interest. There is virtually no tidewater zone that does not have an abundance of some sought-after species. Types of fishing range from dip netting for river herring at the head of the Bay to deep fishing for large drum in the southern section. The upper Bay is known for its spring run of anadromous (American shad, alewife, blueback herring, hickory shad, and striped bass) and semi-anadromus (white perch and yellow perch) fish to their spawning grounds in the upper reaches of the tributaries.

3.25 The distribution and abundance of fauna in Baltimore Harbor is quite distinct from that of the Bay due to the impact from the large Harbor industrial complex. The Harbor may be divided into three zones: The semi-healthy zone which extends from the mouth to Fort Carroll; the semi-polluted zone which lies between Fort Carroll and Fort McHenry; and the polluted zone which is composed of the inner harbors and tributaries. This survey revealed 31 invertebrate species in the Harbor. Benthic biomass was low with only 2.9 g/m^2 in the semi-healthy zone, 1.7 g/m^2 in the semi-polluted zones, and 0.2 g/m^2 in the polluted zone. These values are significantly less than the 19.6 g/m^2 found at the Chester River reference station. The principal reason for the paucity of benthos is the fact that the sediments are grossly contaminated with a number of pollutants. In addition to the large amount of chemical pollutants, the Harbor also has high concentrations of coliform bacteria and associated organisms. A new species of amoeba, Acanthamoeba hatchetti, which causes death in laboratory animals, has recently been isolated from Harbor sediments.

3.26 The utilization of Baltimore Harbor as spawning habitat is very limited. The Harbor is, however, used as a nursery and feeding ground for several fish species, white perch being the most abundant, although many show signs of stress. Several bottom dwelling species are conspicuously absent, probably due to the polluted nature of the bottom sediments.

DREDGED MATERIAL AREAS

3.27 The following areas were identified as potential sites to be used for placement of dredged material. These sites are presented here as to their resource conditions from an ecological viewpoint.

Dam Neck

3.28 The Dam Neck disposal site is a previously used interim site which is approved by EPA for the disposal of dredged material which satisfies their criteria for ocean dumping (EPA, 1970). At this time, there is no information on the benthic community. This site lies within the migratory route of many fish species, such as spot, weakfish, croaker, rockfish, and summer flounder. Bottom sediments are predominantly mud according to 1978 grab samples (see Appendix D of the GDM). This site is scheduled to be closed for disposal when the Norfolk Disposal Site is approved by EPA, however the Norfolk District, Corps of Engineers is looking into extending the use of Dam Neck for placement of clean sand suitable for beach nourishment.

Norfolk Disposal Site

3.29 This site is located approximately 17 miles offshore of the mouth of Chesapeake Bay. It is a circular site with a radius of about 4 nautical miles. Sediments in the site consist of fine to medium grain sand. Benthic sampling has been performed and no important commercial species are available in harvestable quantities. Further information may be obtained from the DRAFT ENVIRONMENTAL IMPACT STATEMENT entitled Norfolk Disposal Site, being prepared by the Norfolk District Corps of Engineers.

Fort Story

3.30 Fort Story is a military reservation located adjacent to Virginia Beach and on Cape Henry. A 30-acre site consisting of wide, flat beach fronting a high dunal system, followed by a heavily vegetated and natural bottom land was identified for the storage of sand. This area has been used to stockpile sand for potential beachfill at Virginia Beach. This area has previously been used for storing sand from the Thimble Shoal Channel. The storage capacity at this site is approximately 500,000-750,000 cubic yards.

Tangier Island

3.31 Tangier Island was investigated as a potential location for placement of dredged material for erosion control. Erosion on the western shore of the Island is a severe problem, with the shoreline receding approximately 20 feet per year. It was considered that placement of spoil material along the shoreline in the sublittoral zone, protected by a submerged dike, could protect the existing shoreline from erosion.

3.32 A Virginia State Task Force consisting of State, local, and Federal agencies was formed to study the erosion problem at Tangier Island and recommend possible solutions. VIMS, as part of the State Task Force study, conducted a survey of the benthic species along the western shore in 1976. They found that the area was surprisingly productive with 60 species of invertebrates identified and a faunal density of approximately 4,000 individuals per square meter. The major groups were: polychaetes (36 percent by number, 25 species), molluscs (39 percent by number, 9 species), amphipods (16 percent by number, 6 species), isopods (5.7 percent by number, 5 species), miscellaneous (3.3 per cent by number, 15 species). No grass beds or significant concentrations of commercially harvested species were identified in their report.

Hart and Miller Islands

3.33 Hart Island and Miller Island are located in the Upper Chesapeake Bay, north of the mouth of the Patapsco River. The site is approximately 13 miles due east of Baltimore City, near the mouth of Back River in Baltimore County. The islands are adjacent to one another, once having been a single land mass with sediments composed primarily of sand with an underlying clay bottom. There are wetlands on both islands and a significant portion of Hart Island is forested. The State of Maryland will construct a diked disposal area adjacent to the island to contain bottom sediments dredged from Baltimore Harbor and its approach channels. The containment area will be located on the eastern or bayward side of Miller and Hart Islands at the mouth of Back River about one mile from the nearest point on the mainland. The 1,100 acre enclosure will contain 52 million cubic yards of sediment when filled to its capacity of 18 feet above mean low water (mlw).

Rappahannock Shoal

3.34 This disposal site, located approximately 8 miles north of the Rappahannock Shoal Channel, was studied by VIMS during 1961-1964. The benthos was characterized by large, apparently natural fluctuations in numbers and, to some extent, species composition. Typical species found in the sampling included Enis (razor clam), Mullinia (little surf clam) and Molgula (sea squirt). The disposal area is approximately 2.75 square miles. Initial dredging for the 42 foot project was placed in this area and since that time maintenance dredging has not been required. Sampling then, and in 1978 (see Appendix D of the GDM), indicates that bottom sediments are predominantly clay silt. This area was investigated by an Environmental Impact Statement (EIS-1976) prepared for consideration of permit application. Further information concerning this site can be found in that EIS.

Wolf Trap

3.35 The Wolf Trap site is a previously used open water disposal area approximately 3.97 square miles in size. Dredging for the 42 foot project and subsequent maintenance dredgings have been placed here. To accommodate spoil from the 50-foot deepening, it has been proposed that the disposal area be expanded approximately 1,500 yards eastward. Unfortunately, there has been no monitoring to assess the biological impacts of the previous disposal operations. Consequently, prediction of the impacts of disposal in the extended area is difficult. The previously used area will be utilized before extending the spoil dumping into new areas. It appears that there are no important commercially harvested shellfish concentrations in close proximity to the Wolf Trap site. Blue crabs may overwinter in this area, although the major concentrations occur southward. Bottom sediments are predominantly mud.

THREATENED AND ENDANGERED SPECIES

3.36 Species of plants or animals which are endangered of becoming extinct or are considered rare, and any habitat considered critical for these species survival, are to be protected to the extent practicable in accordance with the Endangered Species Act of 1973.

3.37 Currently, there are two threatened and 11 endangered species which occur or possibly occur in the Chesapeake Bay area. A complete list may be found in Section K of the GDM.

CULTURAL

3.38 The Corps of Engineers is required by the National Environmental Policy Act of 1969 (Public Law 91-190), Section 106 of the National Historic Preservation Act (Public Law 89-665), and Executive Order 11593 (Protection and Enhancement of the Cultural Environment) to identify all sites and properties within a project's potential environmental impact that are eligible for listing in the National Register of Historic Places. To comply with these laws, a cultural resources reconnaissance of the Baltimore Harbor and Channels, channel extensions, and overboard disposal areas was prepared by the Karell Institute, Arlington, Virginia, underwater cultural specialists, in the summer of 1978.

3.39 The cultural resources reconnaissance (Mueser et, al 1978) consisted of a documentary literature search and evaluation of the side scan sonar geophysical survey data to locate and identify shipwrecks and other submerged anomalies in the Baltimore Harbor and Channels. Nine potential shipwreck anomalies and thirty five smaller targets including scattered iron debris, oil drums, chains and lost anchors were located in the navigation channels. It was recommended that an Intensive Survey be undertaken to obtain a closer look at the suspected cultural resource anomalies along with undertaking a proton magnetometer survey of the Baltimore Harbor and Channels.

3.40 A marine intensive survey was conducted by J. Joseph Murphy and Associates in 1979. This consisted of proton magnetometer and side scan sonar surveys in areas not covered by Mueser and physical (hands on) observations by divers.

3.41 A number of magnetic anomalies were recorded and interpreted as being widely scattered debris. No significant cultural targets or submerged sites were found during the Intensive Survey. Three potentially significant cultural targets were located through Remote Sensing and Navigation Chart data. One target was identified as a large mushroom type mooring anchor. A second target, a sunken ship, was located 1/4 mile west of the York Spit Channel. The third object, another sunken ship, was apparently removed in the mid-1970's by the U.S. Coast Guard as an obstacle to shipping. In addition, two unidentified anomalies were located and dived on in the York Spit Channel. A large cement mooring block and a large mushroom type anchoring were located. Both of these objects are above the 50-foot depth and may be obstacles to dredging. Their removal prior to channel dredging, is recommended. No additional investigations in the project channel areas are recommended. For additional details, see Section K of the Main Report.

4. ENVIRONMENTAL EFFECTS

a. Hydrodynamic and Hydrologic Effects

4.01 As part of investigations for the General Design Memorandum, tests on salinity and velocity were performed on the Chesapeake Bay Hydraulic Model in regard to the Baltimore Harbor and Channels AE&D study. Salinities were recorded for surface, mid depth and bottom waters. Results of the model tests have indicated that some salinity differences are associated with deepening the channels.

4.02 Surface waters in Chesapeake Bay south of Tangier Island generally tend to become more saline, while surface waters up bay from Tangier generally become somewhat less saline. Mid depth and bottom waters generally became more saline in the bay during the test. Test results at the mouth of the James and York Rivers indicate a reduced salinity intrusion with fresher deep water.

4.03 The increase in salinity at the bottom depths was greatest in the deeper channels rather than the shallower adjacent areas. This was expected to occur since saline water is more dense than freshwater and the deeper an area is the more saline it usually becomes. The majority of increases based on seasonal averages and reflected by the model tests were in the range of 0 to 2 ppt difference. In general, salinity differences attenuate with distance from the deepened channel and at shallow water stations. Since organisms within the bay usually live within a range of salinities and since salinity distribution varies from year to year, the small salinity increases should not adversely affect the biota. If salinity is critical to certain organisms survival their distribution may be shifted to adjust for any salinity changes which may occur.

4.04 The increase of freshwater at the mouth of the James and York Rivers could cause a shift in biota distribution if the freshwater increase continues up the tributary. Certain organisms living at the extreme ends of their salinity tolerance may have to redistribute. Areas which were non-productive for oysters may now become productive while other oyster areas may become degraded. The presence of the oyster drill, MSX, and other pathogens and predators may be forced out of existing areas. The changes in salinity appear to be small enough not to significantly impact the overall ecosystem of the tributaries.

4.05 The greatest salinity difference indicated by the model tests were in the Patapsco River where a majority of the results were greater than 5 ppt saltier. Stations in nondeepened side channels within the Patapsco River and the main bay connecting channel leading to the C&D Canal indicate a somewhat reduced salinity response compared with adjacent main channel stations. Differences at shallow-water stations within the Patapsco River indicate a much reduced salinity sensitivity to channel deepening. Since the salinity differences seem to be greatest in the channel of the Patapsco River, organisms within the channel will be affected the most. The benthic community within the river may be altered; however, due to contaminated sediments this community is extremely limited. Motile species will avoid the channel if salinities surpass their tolerance level.

4.06 In addition to salinity, the Chesapeake Bay Model test also monitored velocity. In general, only subtle differences were indicated for test comparisons of amplitude, offset, maximum flood, and maximum ebb values with existing conditions. Over 90 percent of these comparison for each of the parameters were within the error band for these measurements.

4.07 Although no major velocity variations were indicated as a result of channel deepening, slight trends in velocity characteristics may indicate subtle variations in the hydrodynamics of the system. The overall reduced velocity (amplitude) at each depth during the plan tests is consistent with increased cross-sectional area associated with channel deepening. The slight trend of increased flood dominance (higher flood and lower ebb velocities) at the lower bay stations indicates the possibility of additional salt intrusion into the main estuary along the deepened channel. A return flow of estuarine water may exist in the shallower nonsampled areas.

4.08 In general, the examination of the current velocity information obtained during the Baltimore Harbor Study on the hydraulic model of Chesapeake Bay has shown that current velocity changes in the model resulting from the enlargement of the navigation channels are relatively small. Since this was expected to occur, no additional investigations are anticipated in this area.

b. **Water Quality Effects**

4.09 The results of chemical testing of the sediments (both bulk analysis and elutriate testing) to be dredged from the Virginia channel sections indicate that these materials have constitutent levels characteristic of "clean" sediments. Unconfined disposal of this material should not have any major adverse impacts on the water column. Turbidity plumes at the dredging sites, and disposal area in open water are expected to be short term and minor due to the nature of the material. Dissolved oxygen concentrations may be expected to depress slightly for a few hours following dredging and disposal at the immediate site. Dredging will cause the water column to become turbid, thereby, reducing light transmission and creating an aesthetically displeasing environment. This may cause a temporary reduction in primary productivity from phytoplankton. In addition, the results of lengthy study by the United States Army Engineer Waterways Experiment Station Dredged Material Research Program (WES/DMRP) regarding characteristics of the sediment load released during open water disposal operations by a bottom dump hopper dredge, the expected dredging method for the Virginia channel sections, indicates that the, "material partitions into a main cloud that descends vertically and a turbidity cloud that is spun off during the dumping and descending phases. The main cloud appears to descend at a high velocity...and then collapse onto the bottom. The main cloud should experience negligible effects due to ambient water currents and variations in water density. The turbidity cloud will most probably be moved out of the general dump site area by even the smallest currents. Compared to the main cloud which descends to the bottom, the turbidity cloud is very small in terms of total solids."

4.10 Dredging operations in Maryland are expected to occur with bucket and scow which may cause more turbidity than hopper dredges. However, impacts to the water column should be minor, localized, and temporary. The Dredged Material Research Program also reports that metals and other chemical substances may be released to the water column during disposal operation; however, the releases were of small magnitude and short duration, and the pelagic community did not appear to be adversely affected. No adverse water quality effects are expected to occur from disposal operations in Hart-Miller and to insure acceptable water quality, the State of Maryland will have a monitoring plan to confirm and to manage disposal operations.

4.11 Results of grain size analysis in the Virginia channels have indicated that the sediment in the Rappahannock Shoal Channel is composed of silts, clays, and organics, and the York Spit Channel is mostly sandy silt and clay. When placed overboard, this material will be exposed to bottom currents and other erosional forces. An analysis of the fate of the dredged material is dependent on the dredging material and disposal operation, the nature of the dredged material, and the energy regime and bottom sedimentology of the disposal area.

4.12 The material will settle through the water columns as a cloud rather than as individual particulars. This cloud will flatten out as it strikes the bottom with a small verticle dimension usually ranging from 3 to 6 inches. Current and transportational forces will start to effect the flattened mound.

4.13 Due to the depth of 80 feet at the Rappahannock Shoal Disposal Site, wave induced bottom velocities will be negligible. The primary energy source for sediment movement would be tidal currents. Data from the Chesapeake Bay Model test concerning velocities and the size ofthe material in the channel indicate that the material being placed in the Rappahannock Shoal Disposal Area will tend to leave the site and move in a northern direction or locally into deeper parts of the bay floor where currents are reduced. This analysis seems to concur with a study by VIMS in 1976 in this same area which concluded that dredged material placed there would move out of the area and in a northern direction.

4.14 For the Wolf Trap Disposal Area, the material from the York Spit Channel is susceptible to erosion. Wave induced bottom velocities could add to the ambient bottom currents in this area on a periodic basis. Similar to the material from the Rappahannock Shoal Disposal Area, material eroded out of the Wolf Trap Site would also be expected to move northward in the bay or locally to deeper parts of the bay floor. A more detailed analysis of the fate of dredged material may be found in Section K of the Main Report.

4.15 To help control any adverse effects of sediment dispersion, there will be controlled placement of the material by the contractor so the material can be contained within the site as much as possible. The Corps and members of the Technical Advisory Group (see Section H) are developing a monitoring plan which will include monitoring the fate of the dredged material as to its initial impacts on the bottom and the flattening out over a designated area.

4.16 Material from the Maryland channels will be placed into a confined disposal facility at Hart-Miller Islands. The sediments will be contained in the site with constant monitoring to meet State Water Quality Standards.

Ecological Effects

4.17 The ecological effects of dredging and disposal should be basically the same for the Virginia channels and disposal areas, and the Maryland channels. The individual channels and disposal areas will not be presented here; however, the overall effect of dredging and disposal will be presented.

4.18 The finfish within the immediate project area may be disturbed by the mechanical action of the dredge, the noise of the dredge, and the localized turbidity resulting from the dredging operation and subsequent disposal. Adult finfish should be able to avoid being impacted during the dredging and disposal operation, but species which feed on benthic invertebrates may be affected by a temporary lack of forage species in the channel and disposal area. This impact should not be severe, since the dredged areas and disposal areas are relatively small in comparison to the area of the bay.

4.19 There are no commercial shellfish beds in the vicinity of the dredging areas in the Virginia portion of the project; however, blue crabs congregate in the lower, deep water portion of Virginia (York Spit and Cape Henry) to overwinter. To avoid impacts to these organisms, dredging will not be performed from 15 November to 15 March in any dredging year in those channels. The channel in Maryland passes in the vicinity of chartered oyster bars. The fact that these oyster bars are located in much shallower water than the channel should help to lessen the possibility of impact. The State of Maryland has monitored maintenance dredging activities and associated open water disposal from the channels in Maryland for the period 1975-1978 and has found no significant impacts (MD DNR, 1975, 1976, 1977, 1978).

4.20 The dredging of the channels will eliminate the existing benthic organisms present within the channels. The channels will repopulate with benthic organisms which will be constantly disturbed by action of passing ships. This will be a minor impact since this action is existing at the present depths.

4.21 An additional portion of the benthic community may be covered by sediment deposition resulting from dredging or economic loading. Economic loading is generally defined as the practice of increasing the percent of solids per load for a hopper dredge by allowing the hopper or scow to overflow while additional solids settle out of suspension. The additional yardage per load is balanced against the cost of the plant for the time overflow is taking place to determine when plant cost is exceeding the benefits derived from the added payload. This overflow carries a percentage of finer sediments which eventually settle out in the immediate vicinity of the channel. The potential effect on benthics is of most concern in the Rappahannock Shoal Channel due to the fine grain material being dredged. As part of a proposed monitoring plan, the area adjacent to the York Spit and Rappahannock Shoal Channels will be monitored as to the effect on the adjacent benthic communities.

4.22 Deposition of the dredged material will cover existing benthic organisms in the proposed disposal areas. Repopulation of these sites will start to occur after disposal activities have ceased. Recovery studies performed in the bay have shown that repopulation occurs within 1-2 years subsequent to disposal (Schubel 1980). Since the Wolf Trap, Rappahannock Shoal, and Dam Neck areas were previously used for deposition of dredged material, the biological community which will repopulate should basically remain the same as existing populations. The entire Norfolk Disposal Site has not been used for disposal, as of yet; however, portions of the site have been used intermittently from around 1900 to 1965. Repopulation should occur from within the disposal area between disposal operations and subsequent to the cessation of disposal operations in a designated area. The introduction of dredged material into the site may cause an increase in species diversity depending on the characteristics of the material being placed there and the existing sediments.

4.23 Since the disposal sites are located in an erosional area, the dredged material, as previously mentioned, will probably leave the site. This may also have a potential effect on the benthic communities outside the designated disposal sites. As part of the proposed monitoring plan, baseline conditions will be examined in the disposal sites. In addition, baseline monitoring will occur in alternative disposal sites which may be used if significant impacts occur at the identified sites during disposal activities.

4.24 The Fort Story disposal site is a previously used upland area which would be used for sand storage from the Cape Henry channel, for beneficial uses in Virginia. Environmental impacts to the site should be minor, localized and temporary. Any existing vegetation in the area may be disturbed with disposal; however, this should be minimal. The disposal area can accommodate approximately 500,000 to 750,000 cubic yards of material. Some escape of finer sediments from actual operations on the beach can be expected, but will probably be reintroduced into the nearshore environment.

4.25 Placement of dredged material within the Hart-Miller containment site will cover any existing benthic organisms. The additive effects of covering benthics from that already resulting from construction will be negligible. This site has been designated by the State of Maryland as a contained site for placement of dredged material and has been investigated in the Final Environmental Impact Statement, February 1976, it will not be discussed further.

c. **Threatened and Endangered Species**

4.26 Project activities are not expected to adversely affect any threatened or endangered species likely to be found in the project area. Of the species listed in Section K, page K-18, the green, loggerhead, the Kemp's Ridley, Leatherback, and Hawkshill Turtles, and the Shortnose Sturgeon may potentially be found near construction areas. Additionally, no critical habitat necessary for those turtles is located within the Bay area and their preferred range encompasses warmer waters.

5. LIST OF PREPARERS

5.01 The following people were primarily responsible for preparing this Environmental Impact Statement:

NAME	EXPERTISE	EXPERIENCE	PROFESSIONAL DISCIPLINE
Mr. Stuart Appelbaum	Engineer	3 yrs. Feasibility Studies U.S. Army Corps of Engineers	Civil Engineer
Mr. Robert Blama (EIS Coordinator) (Project Manager)	Generalist	3 1/2 yrs. EIS Studies U.S. Army Corps of Engineers	Biologist
Mr. J. Michael Coleman	Engineer	3 1/2 yrs. Feasibility Studies U.S. Army Corps of Engineers	Civil Engineer
Mr. Stephen Israel	Archeology	11 yrs. Field Experience 4 yrs. EIS Studies U.S. Army Corps of Engineers	Archeologist
Mr. Steve Wilson	Economist	5 yrs. Economic Studies U.S. Army Corps of Engineers	Regional Economist

6. PUBLIC INVOLVEMENT

a. Public Involvement Program

6.01 Public involvement, as discussed in Section 3 of the main report of the General Design Memorandum, has been important to the study in regard to identification of publicly perceived problems and desires and obtaining information. The components of the public involvement program and their results are summarized here. Early in the study, letters were sent to Congressional, Federal, State, and local entities to inform them of study initiation and to request their input. A technical advisory group was formed in 1976 to assist in the identification of existing information sources, remaining information needs, means of data collection, specific concerns, and to provide timely contributions to and review of the study documents. Coordination of a specific nature involved publication of a Notice of Intent to Prepare a Draft EIS in the Federal Register of 24 February 1981 and continued involvement of the U.S. Fish and Wildlife Service in compliance with the Fish and Wildlife Coordination Act. Of a general nature, all appropriate Federal, State and local resource agencies have been involved by providing requested information, review and comments of technical material and with discussions on specific issues. The draft report and DEIS were circulated to the public and a public meeting was held on 24 June 1981. Future public involvement activities include distribution of a final report and final EIS.

b. Required Coordination

6.02 Throughout the study, coordination has been maintained with appropriate Federal, State, and local agencies and interests. Following review of the Draft report and EIS by the Fish and Wildlife Service (FWS), they will prepare a FWS Coordination Act Report to comply with the Coordination Act. This report is presented in Addendum II. Required coordination remaining to be done include distribution of a final report and EIS.

c. Statement Recipients

6.03 The following list indicates the State and Federal agencies with which the Main Report/DEIS was coordinated.

<u>Federal Agencies</u>

Department of Interior
Department of Commerce
Department of Energy
Department of Transportation
Environmental Protection Agency
Department of Agriculture
Department of Housing and Urban Development
Department of Health and Human Services
U.S. Coast Guard

State Agencies

Maryland (through the Maryland State Clearinghouse)

Department of Agriculture
Department of Economic and Community Development
Department of Health and Mental Hygiene
Department of Natural Resources
Department of State Planning
Department of Transportation
(Maryland Port Administration)
Soil Conservation Service
State Extension Service
State Historic Preservation Office

Virginia (through the Virginia State Clearinghouse)

Department of Commerce and Resources
Department of Agriculture and Commerce
Department of Conservation and Economic Development
Department of Health
Historic Landmarks Commission
Transportation and Public Safety
Virginia Port Authority

Other Interested Parties - A mailing list of local agencies, organizations and individuals expressing interest in this or related projects in the past has been compiled. The mailing list is available for review at U.S. Army Engineer District, P.O. Box 1715, Baltimore, Maryland 21203. A Notice of Availability of the DEIS was mailed to organizations and individuals on the mailing list in conjunction with the Notice for the Public Meeting. The final report and EIS will be sent to parties known to have an interest in the study.

d. Public Views and Responses

6.04 The views of the public have been expressed through correspondence and direct communication with the Baltimore District. A public meeting was held in Baltimore, Maryland on 25 May 1966 to obtain information as to the improvements desired by local interests. The Project Document was fully documented with concerned Federal, State, and local agencies and local interests. Several meetings were held with non-Federal interests during the preparation of the supplemental information requested by the Office of Management and Budget in 1973. The draft supplemental information was coordinated with various public and private interests. The Plan of Study for the GDM was provided to Federal and State agencies in 1977 for their information. A public meeting was held on 24 June 1981 to present the findings and recommendations of the study.

6.05 Written comments were received throughout the study from the U.S. Fish and Wildlife Service (F&WS), and the Environmental Protection Agency (EPA), and are shown in Appendix E of the Technical Appendices.

6.06 The F&WS commented on the need for time of year restrictions on project dredging in order to minimize environmental impacts. They also commented on the need for a monitoring program during project construction to assess environmental effects. As presented in discussion in the Main Report and EIS, both of these concerns have been incorporated into the plan.

6.07 The EPA indicated that the material dredged from the Cape Henry and part of the York Spit channels appeared to be acceptable for open water disposal. EPA also requested coordination of selection of ocean disposal sites with the Corps. The plan will use the EPA designated ocean disposal site as explained in the Main Report and EIS.

6.08 Following public review of the DEIS, comments were received. These comments and responses to these are presented in Addendum II.

7. INDEXES, REFERENCES, AND APPENDIXES

7.01 A list of pertinent subjects and where they are located are presented in Table EIS-3.

TABLE EIS-3 - Index, References and Appendices

TABLE EIS-3 - Index, References and Appendices (con't)

References:

Marine Sciences Research Center, State University of New York, "A General Assessment of Selected Dredging/Disposal Options for Three Federal Dredging Projects in Upper Chesapeake Bay", 1980.

Maryland Department of Natural Resources, "Management Alternatives for Dredging and Disposal Activities in Maryland Waters", 1977.

Mueser, Rutledge, Wentworth and Johnston Consulting Engineers and Ocean Seismic Survey, Inc., "Baltimore Harbor and Channels, 50-Foot Project, Geophysical Foundation Exploration Report", 1978.

References (con't):

Murphy, J.R., Murphy Archeological Research Services, Inc., "Marine Intensive Survey and Evaluation Investigations for the Baltimore Harbor and Channels", 1980.

U.S. Army Engineer District, Baltimore, "Review Report, Baltimore Harbor and Channels", 1969.

U.S. Army Engineer District, Baltimore, "Baltimore Harbor and Channels, Maryland and Virginia - Supplemental Information Requested by the Office of Management and Budget to June 1969 Review Report", 1974.

U.S. Army Engineer District, Baltimore, "Final Environmental Impact Statement, Hart and Miller Islands", 1976.

U.S. Army Engineer District, Norfolk, "Draft Environmental Impact Statement, Norfolk Disposal Site", 1981.

U.S. Army Engineer, Waterways Experiment Station, "Baltimore Harbor and Channels Deepening Study - Chesapeake Bay Hydraulic Model Investigation", 1981.

U.S. Army Engineer, Waterways Experiment Station, "The Dredged Material Research Program Synthesis Report Series No. DS-78-1 through DS-78-21", 1978.

Virginia Institute of Marine Science, "Baltimore Harbor and Channels: Surface Sediments in Virginia Channels", 1978.

Virginia Institute of Marine Science, "Biological Description of Old Plantation Flats, Deep Trough: A Proposed Dredged Disposal Site", 1979.

Virginia Institute of Marine Science, Special Scientific Report, Musick, "A Checklist of the Files of Chesapeake Bay and Adjacent Coastal Plains in a Checklist of the Biota of Chesapeake Bay and Adjacent Virginia Seas", Vol. 65, pp 175-212, 1972.

Virginia Institute of Marine Science, "A Study of the Effects of Dredging and Dredge Spoil Disposal on the Marine Environment", 1967.

Virginia Institute of Marine Science, "Shore Erosion at Tangier Island", 1976.

Virginia Institute of Marine Science, "Study of Channel Sediments - Baltimore Harbor, Norfolk Harbor, York Entrance Channel", 1972.

Section 404(b)(1) Evaluation

The purpose of the 404 Evaluation is to comply with the provisions of Section 404 of the Clean Water Act of 1977 (33 U.S.C. 1344(r)).

1. **Project Description**

a. Description of the proposed discharge of dredged or fill materials

(1) General characteristics of material

In the Maryland portion of the project the materials consist of sands, gravels, silts, and clays. Chemical analysis of these materials indicate that some of the material is contaminated with heavy metals while other material meets overboard criteria for placement in open water of the Bay. This material will be placed in a confined disposal area in order to comply with 404(b)(1) guidelines. The effluent returning to the waterway is also subject to these guidelines. This effluent will meet water quality standards set by the State of Maryland.

The channels in the Virginia portion of the project consists of some sand, mostly sandy silts, and clays. Chemical analysis of this material indicates clean sediments which meet overboard criteria for placement in the Bay.

(2) Quantity of material proposed for discharge

The quantity of material being dredged is approximately 72 million cubic yards (mcy). This includes about 41 mcy in Maryland channels and 31 mcy in Virginia channels.

(3) Source of material

The source of the dredged material will be from the three channels in Virginia waters and the various channels in the Maryland waters.

b. Description of the proposed discharge sites(s) for dredged or fill material

(1) Location and areal extent (include map)

The proposed discharge site for material from the Maryland channels in Hart Miller Island, which is located at the mouth of Back River. (See Figure L-4 in Main Report). The material from the Virginia channels will be placed overboard at the following locations: material from Cape Henry will be overboarded in the Ocean and placed in an upland site at Cape Henry (Figure L-1). Material from the York Spit channel will be placed at the Wolf Trap disposal site (Figure L-2) and the material from Rappahannock Shoal channel will be placed in the Rappahannock Shoal disposal area. (Figure L-3)

(2) Type of discharge site(s)

The Hart-Miller Island complex is a confined open water disposal site and will receive all of Maryland's disposal material. The dredged material from the Virginia channels will be placed unconfined and overboard in the bay and ocean, and some material being stockpiled at Fort Story.

(3) Method of discharge

The method of discharge will be decided by the contractor at the time of construction. However, it appears at present that the most likely method of discharge will be by hopper dredge in Virginia and by bucket and pumped from scows in Maryland.

(4) When will discharge occur?

It is estimated that total construction will take approximately 3 years. In the Maryland channels dredging for this project can occur anytime during the year. In Virginia, the dredging in the Cape Henry channel and York Spit channel will not be performed during 15 November through 15 March to avoid disruption to overwintering blue crabs. The Rappahannock shoal channel does not have a restricted dredging period.

(5) Projected life of discharge site(s)

Hart-Miller Island will receive all the initial dredging and 10 years of maintenance dredging. Other sites will have to be identified to accommodate further maintenance. The open water sites in the ocean and the bay are expected to be available for the project life of 50 years.

(6) Bathymetry (if open water discharge)

Changes in bathymetry are expected to occur at the sites as a result of placement; however, investigations have shown that at least some portion of the material is likely to leave the sites in the Bay over time. In addition, part of the monitoring plan will attempt to ascertain the degree and significance of the movement.

2. **Physical Effects**

a. Will wetlands be lost?

No wetlands should be affected due to dredging or disposal operations.

(1) How productive are the wetlands? N/A

(2) What do the wetlands produce? N/A

(3) Are the wetlands important for: N/A

(a) Food chain production N/A

(b) General habitat N/A

(c) Nesting N/A

(d) Spawning N/A

(e) Rearing N/A

(f) Resting N/A

(4) If wetlands will be lost, quantify the losses indicated relative to that of the remaining contiguous wetlands. N/A

(5) Are the wetlands set aside:

(a) for study of the aquatic environment? N/A

(b) as a sanctuary or refuge? N/A

(6) Will the characteristics of contiguous wetlands be changed? N/A

(a) natural drainage N/A

(b) sedimentation N/A

(c) salinity N/A

(d) flushing N/A

(e) current N/A

(f) other N/A

(7) Do affected wetlands significantly shield other areas from:

(a) wave action N/A

(b) erosion N/A

(c) storm damage N/A

(d) If so, how will the shielding effect be changed? N/A

(8) Are the wetlands prime natural recharge areas? If so, what is the relative importance? N/A

b. What will be the effects on the water column as to:

(1) light transmission

No affect from disposal in Maryland waters due to placement in contained disposal area. Dredging, if done by bucket and scow may cause minor turbidity. In Bay area turbidity resulting from disposal will result in minor and temporary reduction in light transmission.

(2) aesthetic values

Turbidity plume resulting from construction will present a temporary adverse aesthetics effect in the immediate vicinity of the dredging, and in the case of Virginia, with the overboard disposal sites.

(3) direct effects on

(a) Nekton

Potential entrainment of small organisms and minor effects resulting from physical abrasion during construction. Disposal could cause the burial of some organisms; however, construction activities will have more of an effect upon nekton distribution than temporary water quality changes. Most nektonic organisms should avoid the area.

(b) Plankton

Placement of dredged material should have a minor affect on plankton resulting from burial by siltation in the overboard sites. Productivity may temporarily decrease as a result from the increase in turbidity.

c. What will be the significance in covering the benthos as to:

(1) relative extent of loss

The benthos in the channels will be removed during the dredging process and the benthos in the disposal site will be buried during placement of the dredged material. Areas adjacent to the channels may have minor affects due to siltation. The area north of the disposal areas may be affected by migration of material after deposition.

(2) time required for repopulation

Repopulation will start to occur in the channels and disposal sites immediately after dredging and disposal respectively and should recover within 1 - 2 years. Repopulation in the dredged material plcement sites in Virginia will be monitored to determine how quick these areas will recover.

(3) change in benthic community

There should not be an overall change in the benthic community as a result of construction activities. Dredged material migrating from the disposal areas may cause habitat changes, and subsequent benthic community changes; however, the degree of impact cannot be determined at this time. DMRP studies have shown that recolonization of a disturbed area is accomplished by benthos burrowing up through the dredged material or migrating into the area or by reproduction and/or recruitment of benthos from outside the affected area. Recolonization is expected from recruitment outside the affected area. This will be delayed since the disposal operation will occur over a three-year period. The benthic community in the disposal area and adjacent areas will be monitored.

(4) affect on other species which are dependent upon the benthos

Minor and short term losses of potential food sources to fish are likely. These organisms may be forced to seek food from other areas.

d. What will be the change in:

(1) bottom geometry

The channels will be deepened and widened to project specifications (see Section C of GDM). Deposition will cause a change in bathymetry which should be affected when subjected to erosional forces in the area which will cause some of the material to move out of the area. This will also be included in the monitoring plan.

(2) substrate composition

Desposition into the proposed overboard disposal sites should not alter the substrate composition significantly from that which is present. The sites have had similar materials placed there in the past. It is known that portions of the material migrates from these areas, but it appears the material to be placed as a function of this work is not significantly different from existing material. This will be more carefully determined during baseline monitoring.

(3) salinity gradients

Results of the model tests have indicated that some salinity differences are associated with deepening the channels. Salinity gradients within the bay are not expected to change significantly. Surface waters in Chesapeake Bay south of Tangier Island generally become somewhat less saline. Mid depth and bottom waters generally became more saline in the bay during the test. However, test results at the mouth of the James and York Rivers indicate a reduced salinity intrusion with fresher deep water. The greatest salinity change is expected in the channel of the Patapsco River.

(4) alteration of biological communities due to exchange of constituents between sediments and overlying water?

No long term alteration of biological communities is anticipated with construction of the project.

3. Chemical - Biological Interactive Effects

a. Does the material meet the exclusion criteria? (If so, state the rationale.)

All material anticipated for open water disposal meet the exclusion criteria, however all of this material was chemically tested. Samples were taken in the dredging and disposal areas, and results indicate sands, silts, and clays. The Virginia channels and part of the Maryland channels are away from a point source of pollution, and have no history of outside contamination, chemical testing, therefore, was not needed, however was performed (Appendix C). A portion of the materials in the Maryland channels, inside Baltimore Harbor, is considered polluted and was tested by VIMS in 1978. Since overboard disposal was anticipated for the Virginia channels and the uncontaminated Maryland material has been investigated in the past for uses other than confined disposal, all material for the project were chemically tested. Results of sediment sampling (Appendix C - Technical Appendixes) in the Virginia channels show low levels of all parameters tested when compared with guideline levels recommended by the Spoil Disposal Criteria Committee. Results of elutriate analysis performed for the dredging and disposal areas showed little affect upon ambient water quality. Sediments tested in Maryland waters indicated a grossly polluted surface layer of sediments within the inner harbor, diminishing in level of contamination as the harbor mouth is approached, and finding sediments in the project channels in the Bay, suitable for open water disposal. The material from the Cape Henry channel will be placed overboard in the ocean and according to EPA the material meets the exclusion criteria for ocean disposal.

*Note that if the material meets the exclusion criteria no further testing under 40 CFR 230 is required.

b. Water column effects of chemical constituents. Are contaminants released? If so, at what levels?

No contaminant release is anticipated with disposal activities. Some potential contaminants could be released during dredging operations in the Inner Harbor dredging, however, these are anticipated to be negligible. Effluent from Hart-Miller Islands will be managed to insure compliance with State Water Quality Standards.

c. Effects of chemical constituents on benthos

No adverse affect is anticipated with disposal operations.

4. Description of site comparison

The disposal site for the Maryland channel dredging was identified by the State and found to be acceptable. The State of Maryland initiated a study which looked for adequate sites in the Chesapeake Bay for placement of dredged material. An evaluation of potential sites investigated can be found in Addendum I of the main report. The disposal sites for the Virginia channels were chosen since they were previously used sites. Other areas were investigated and the results can be found in Section K of the main report and the EIS. The State of Virginia can identify areas other than the selected sites for an acceptability analysis for use as an alternative site.

a. Total sediment analysis

Analysis comparing the disposal sites investigated can be found in the GDM and EIS.

b. Biological community structure analysis (40 CFR 230.4-1(c)(2))

Analysis comparing the disposal sites investigated can be found in the GDM and EIS.

5. **Review Applicable Water Quality Standards**

a. Compare constituent concentrations - Placement of dredged material will conform to Applicable Water Quality Standards since sediments from the dredging and disposal areas in the Virginia portion comply to criteria set by the Spoil Disposal Criteria Committee in 1975. Some of the material being placed in the Hart-Miller Island site is contaminated. Effluent standards of 4 grams per liter of sediment will be met at the site. Since contaminants adhere to the sediments, the release of pollutants into the Bay should be minimal. Also the Corps of Engineers permit for Hart-Miller states that, "The permittee will proceed in a manner that will insure compliance with and achievement of the objectives contained in the guidelines promulgated by the Environmental Protection Agency under Section 404(b) of the Federal Water Pollution Control Act. Amendments of 1972 (40 CFR 230).

b. Consider mixing zone - N/A as placement of dredged material will conform to Applicable Water Quality Standards as well as effluent from Hart-Miller Islands confined disposal site.

c. Based on a and b above will disposal operation be compatible with applicable standards? Disposal will conform to Applicable Standards

6. **Selection of Discharge Sites for Dredged or Fill Material**

a. Need for the proposed activity

Dredging for deepening of navigation channels

b. Alternatives sites and methods of discharge considered

Alternative sites were investigated and the analysis can be found in the EIS. The selected sites were identified by the State or are previously used areas. The method of discharge will differ depending on the channel being dredged and the location and type of disposal area. The actual method of discharge will be a responsibility of the contractor.

c. Objectives to be considered in discharge determination:

(1) Impacts on chemical, physical, and biological integrity of aquatic ecosystem

Overall impacts should be minor when compared to the Bay. Localized impacts will occur at the disposal sites but should be minor and temporary. Impacts such as salinity changes are anticipated to be generally limited to the channels.

(2) Impacts on food chain

This impact should be minor, localized and temporary

(3) Impact on diversity of plan and animal species

This also should be minor and localized

(4) Impact on movement into and out of feeding, spawning, breeding and nursery areas

This impact should be minor and temporary due to the size of the Bay. Also to avoid disruption to overwintering blue crabs dredging in the Cape Henry and York Spit channels will be restricted between 15 November and 15 March.

(5) Impact on wetland areas having significant functions of water quality maintenance - N/A No wetlands to be affected.

(6) Impact on areas that serve to retain natural high waters or flood waters - N/A

(7) Methods to minimize turbidity

The diked disposal area at Hart-Miller Islands will allow for retention of material and effluent will be in accordance with water quality standards. Overboard disposal in Virginia is not anticipated to cause significant turbidity.

(8) Methods to minimize degradation of aesthetic, recreational, and economic values

Construction will be adhere to applicable standards. Channels in Maryland and Virginia will be dredged simultaneously to shorten the construction time.

(9) Threatened and endangered species

No threatened or endangered species are expected to be affected with project construction.

(10) Investigate other measures that avoid degradation of aesthetic, recreational, and economic values of navigable waters

Other methods of dredging were investigated as a part of the economic analysis to reduce costs. This would have conceivably reduced the expected minor environmental impacts further. However, these were determined not to be feasible (i.e. - one way channel for safety reasons).

d. Impacts on water uses at proposed discharged site

(1) Municipal water supply intakes - N-A

(2) Shellfish - Minor and temporary impacts resulting from turbidity and siltation. Overwintering blue crabs adjacent to the Cape Henry and York Spit Channels will be avoided by not dredging between November and March.

(3) Fisheries

Impacts upon the fisheries are anticipated to be minor as these animals are likely to avoid the area of construction. The impacts upon their habitat and hence indirectly upon the fisheries themselves are also expected to be minor.

(4) Wildlife - minor effects due to the type and location of the project.

(5) Recreation activities - minor effects due to construction activities.

(6) Threatened and endangered species - no effect anticipated.

(7) Benthic life

There will be a complete loss of the existing benthos inhabiting the discharge sites, and possibly some affect to adjacent areas, however repopulation should occur in these areas.

(8) Wetlands N/A

(9) Submersed vegetation - no submerged vegetation in area of disposal operation.

(10) Size of disposal site

The sizes of the proposed disposal areas are as follows: Norfolk disposal site in the ocean is 50.24 square miles, Wolf Trap disposal area in the bay is 3.97 square miles, Rappahannock Shoal area in the bay is 2.75 square miles. The Hart-Miller complex in the bay is an 1,100 acre enclosure.

e. Considerations to minimize harmful effects

(1) Water quality criteria

The disposal operation will conform to applicable water quality standards.

(2) Investigate alternatives to open water disposal

Considering the location of the channels to be dredged, open water disposal is the most economically feasible as well as being the most logistical.

(3) Investigate physical characteristics of alternative disposal sites

The physical characteristics of all disposal areas investigated can be found in the GDM and EIS.

(4) Ocean dumping

Ocean dumping will occur with the material dredged from the Cape Henry Channel.

(5) Where possible, investigate covering contaminated dredged material with cleaner material

The areas designated for overboard disposal and the general location of the channels are free from point sources of pollution. Contaminated material from Baltimore Harbor will be placed in the confined disposal area and then covered with cleaner material.

(6) Investigate methods to minimize effect of runoff from confined areas on the aquatic environment

The only confined area is the Hart-Miller disposal site. Operation of the site will be under management of the State of Maryland. Water quality standards for discharge will be met by the State.

(7) Coordinate potential monitoring activities at discharge site with EPA

As a member of the Technical Advisory Group (TAG) for the project, EPA has had the opportunity to assist in creating an approved monitoring plan. This opportunity will continue as the monitoring plan is refined, conducted and results reviewed.

7. Statement as to contamination of fill material if from a land source - N/A

8. Conclusions and determinations.

a. An ecological evaluation has been made following the evaluation guidance in 40 CFR 230.4.

b. Appropriate measures have been identified and incorporated in the proposed plan to minimize adverse effects on the aquatic environment as a result of placement of dredged material.

c. Consideration has been given to the need for the proposed activity, the availability of alternative sites and methods of disposal that are less damaging to the environment and such water quality standards as are appropriate and applicable by law.

9. Findings

The findings has been made that the discharge site for deepening of the Baltimore Harbor and Channels project has been specified through the application of the Section 404 (b)(1) guidelines. The placement of any fill material will conform to applicable Water Quality Standards so as to minimize any adverse impacts upon the aquatic ecosystem.

ADDENDUM II

PUBLIC VIEWS AND COMMENTS

Background Correspondence

1. The Secretary of the Maryland Department of Transportation, in conjunction with the Commonwealth of Virginia, has provided the assurances for all items of required local cooperation discussed in the Main Report. Pertinent correspondence relating to these assurances is included among the correspondence in the Addendum.

2. A discussion of the Public Meeting and a list of State and Federal agencies which received the draft report and EIS can be found in Section J (Public Views and Responses) of the Main Report, and the Public Involvement section of the EIS.

3. Comments and responses on the draft report and draft EIS have been incorporated into the final report and can be found in this Addendum.

LETTERS

OF

LOCAL ASSURANCES

Maryland Department of Transportation
The Secretary's Office

Harry Hughes
Governor

James J. O'Donnell
Secretary

April 28, 1981

Colonel James W. Peck
Baltimore District
Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203

Dear Colonel Peck:

Attached are three letters which I understand should complete the documentation of local assurances which you need in order to proceed with the Baltimore Harbor and Channels 50' project.

The first is a revised and updated letter from the State of Maryland to the Corps of Engineers which states our intent to provide local cooperation for the entire Baltimore Harbor and Channels 50' project, regardless of location.

The second is a letter from the Commonwealth of Virginia to the State of Maryland which designates dredged material disposal sites for use by the Corps of Engineers when constructing the Baltimore 50' Channel project in Virginia waters. Maryland's attached letter of intent passes this designation on to the Corps of Engineers.

The third is a letter from the Commonwealth of Virginia to the State of Maryland which certifies that (1) the Commonwealth has in-place a water control agency with the necessary legal authorization to establish standards to regulate water quality for control of pollution in Virginia waters; and (2) that the Commonwealth will comply with Title VI of the Civil Rights Act of 1964. Maryland's letter of intent to the Corps of Engineers recognizes Virginia's jurisdiction and authority in these matters for that

My telephone number is (301) – 787-7397

Post Office Box 8755, Baltimore-Washington International Airport, Maryland 21240

portion of the Baltimore 50' project located in Virginia waters.

Again, it is my understanding that these three documents and Maryland's letter of January 12, 1981, which designated the Hart-Miller site for project use in Maryland waters, provide you with all the local assurances necessary to proceed full speed with the Baltimore 50' Channel project. If you have any thoughts or concerns on this matter, please do not hesitate to contact me or my staff at the Maryland Port Administration.

Sincerely,

James J. O'Donnell
Secretary

JJO'D:drb
Enclosure

Maryland Department of Transportation
The Secretary's Office

Harry Hughes
Governor

James J. O'Donnell
Secretary

April 28, 1981

Colonel James W. Peck
Baltimore District
Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203

Re: The Baltimore Harbor and Channels 50' Project

Dear Colonel Peck:

It is the intent of the State of Maryland to provide the local cooperation for the entire Baltimore Harbor and Channels 50' project, regardless of location of work activities, and in accordance with Section 101 of the River and Harbor Act of 1970, PL 91-611, and Section 221 of the Flood Control Act of 1970, PL 91-611. At the commencement of construction of this project, the State of Maryland shall:

a. Provide without cost to the United States all land, easements, and rights-of-way required for construction and subsequent maintenance of the Project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of dredged material and necessary retaining dikes, bulkheads, and embankments therefor, or the costs of such retaining works; and

b. Hold and save the United States free from damages that may result from the construction and maintenance of the project, except damages due to the fault or negligence of the United States or its contractors;

c. Provide and maintain at local expense adequate public terminal and transfer facilities open to all on equal terms, and depths in berthing areas and local access channels serving terminals

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commensurate with the depth provided in the related project areas;

d. Accomplish without cost to the United States such utility and other relocations or alterations as necessary for project purposes;

e. Prohibit erection of any structure within 125 feet of the project channel or turning basin;

f. Establish regulations prohibiting discharge of pollutants into waters of the channels and harbor by users thereof, which regulations shall be in accordance with applicable laws or regulations of Federal, State, and local authorities responsible for pollution prevention and control;

g. Comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646, 84 Stat. 1894) and implementing regulations;

h. Comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352, 78 Stat. 241).

For the Virginia portion of the Baltimore Harbor and Channels 50' project, provision of item "a" above by the State of Maryland is given in compliance with conditions as specified in the April 24, 1981 letter of designation, Maurice B. Rowe and George M. Walters to James J. O'Donnell, attached. Provision of items "f" and "h" for the Virginia portion of this project is given in recognition of the jurisdiction and authority of the Commonwealth of Virginia, as evidenced in the April 24, 1981 letter of certification, Maurice B. Rowe and George M. Walters, to James J. O'Donnell, attached.

An unsigned copy of the standard Corps of Engineers 221 Agreement is attached. The State of Maryland will conclude a 221 Agreement, substantially in this form, with the Corps of Engineers prior to the start of construction of the Baltimore Harbor and Channels 50' project.

Sincerely,

James J. O'Donnell
Secretary

JJO'D:drb
Enclosure

April 24, 1981

The Honorable James J. O'Donnell
Secretary, Maryland Department of
Transportation
Post Office Box 8755
Baltimore Washington International Airport
Maryland 21240

Dear Secretary O'Donnell:

The Commonwealth of Virginia is pleased to submit this letter providing for the designation of disposal sites for that part of Baltimore's 50' Channel project located in Virginia waters.

Section 101 of the River and Harbor Act, December 31, 1970, PL91-611, authorizes construction of the Baltimore 50' Channel project, and requires local assurances from nonfederal interests. Item "a" of those requirements calls for the affected nonfederal interests, in this case the Commonwealth of Virginia, to provide the federal government with suitable sites for placement of dredged material resulting from the initial dredging and subsequent maintenance of the project.

In response to that requirement, the Commonwealth of Virginia agrees to the following:

1. Ocean disposal of dredged material from the initial dredging and subsequent maintenance of the Cape Henry Channel section and stockpiling of acceptable material at the Ft. Story or an acceptable alternate site for future use by the Commonwealth.

2. In the Chesapeake Bay, the use of the Rappahannock Shoal Deep and the Wolf Trap disposal sites for the placement of dredged material from the initial dredging and subsequent maintenance will be permitted only if all conditions in paragraph 1 below are met.

It is understood that the use of the disposal sites in the Chesapeake Bay, as described above, is contingent upon satisfaction of the following conditions:

1. That the Corps of Engineers, in concert with the Commonwealth, will continue to work to develop a satisfactory monitoring program which includes the spoil disposal sites for the Baltimore 50' Channel project that will serve to protect and preserve the interests of the Commonwealth of Virginia and its citizens. This monitoring program will be developed and initiated prior to any actual placement of dredged material, in order to establish an existing baseline condition in the disposal areas. A portion of the monitoring may be application of sediment dispersion modeling developed by Waterways Experiment Station (WES) as appropriate.

2. That the Commonwealth prior to or during the course of construction of the project may designate alternative disposal sites in the Bay of similar costs, capacities and convenience as the agreed sites. The Commonwealth will designate these alternate sites in sufficient time to allow for baseline monitoring and evaluation and not delay the dredging of the project.

The Commonwealth of Virginia agrees to these actions which will be accomplished without cost to the Commonwealth. Any claims resulting from this construction will not be borne by the Commonwealth of Virginia.

It is also requested that once the project is under construction any contestable issue would result in immediate contact with the Commonwealth.

Sincerely,

Maurice B. Rowe
Maurice B. Rowe
Secretary of Commerce & Resources

George M. Walters
George M. Walters
Secretary of Transportation

cc: The Honorable John N. Dalton
Colonel Douglas Haller
Mr. James Moore

COMMONWEALTH of VIRGINIA

Office of the Governor

Richmond 23219

Maurice B Rowe
Secretary of Commerce and Resources

April 24, 1981

The Honorable James J. O'Donnell
Secretary, Maryland Department of
Transportation
Post Office Box 8755
Baltimore Washington International Airport
Maryland 21240

Dear Secretary O'Donnell:

Previous correspondence has provided the Commonwealth of Virginia's commitment to items of local cooperation with the State of Maryland as set forth in Section 101 of Public Law 91-611 except the following:

f. The Code of Virginia, 1950, §62.1-44.15(3) authorizes the State Water Control Board to "establish such standards of quality and policies for any State waters consistent with the general policy set forth in this chapter...."

The State Water Control Board adopted Standards for Water Quality in April and June 1970 and added several amendments in subsequent years to apply to all State waters which include the Chesapeake Bay.

h. The Commonwealth of Virginia agrees to comply with Title VI of the Civil Rights Act of 1964 (PL88-852, 78 Stat. 241).

Sincerely,

Maurice B. Rowe

Maurice B. Rowe
Secretary of Commerce & Resources

George M. Walters

George M. Walters
Secretary of Transportation

cc: The Honorable John N. Dalton
Robert V. Davis

Maryland Department of Transportation

The Secretary's Office

Harry Hughes
Governor

James J. O'Donnell
Secretary

January 12, 1981

Colonel James W. Peck
Baltimore District
Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203

Re: Designation of Disposal Areas for the Baltimore Fifty Foot Channel Project

Dear Colonel ~~Peck~~: Jim 16/1

The Baltimore Harbor and Channels project modification, as authorized by Section 101 of the River and Harbor Act, December 31, 1970, PL 91-611, requires that eight items of local cooperation be met by local government(s) prior to initiation of the Baltimore Fifty Foot Channel Project by the Corps of Engineers. From the early project planning stages, the State of Maryland has indicated a willingness to furnish these items of local cooperation for the Maryland portion of this project, and provided the Corps of Engineers with a letter of intent to do so on June 12, 1978 (Secretary Intemann to Colonel Withers) copy attached.

Item "a" of the requirements for local cooperation stipulates that the United States will be provided with all lands, easements and rights of way required for project construction and subsequent maintenance, including suitable areas for "initial and subsequent disposal of dredged material and necessary retaining dikes, bulkheads and embankments therefor, or the costs of such retaining works".

In response to this requirement, the State of Maryland herein certifies that it will provide a diked containment facility located at Hart-Miller Islands in the Chesapeake Bay, as authorized by Corps of Engineers Permit NABOP-F/2 (Maryland General Services) 2, 22 November 1976, for disposal of dredged material generated by all Fifty Foot Channel modification work in Maryland waters, and for 10 years

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of subsequent dredging maintenance for the Maryland portion of the completed Fifty Foot Baltimore Channel. Disposal of maintenance material from this project beyond the specified 10 years will be provided by the Maryland Port Administration's recently implemented Dredged Material Management Program.

The designated Hart-Miller Islands facility will have a containment capacity of 52 million cubic yards. That capacity is more than adequate to accommodate the 47.5 mcy of dredged material which the Baltimore Fifty Foot Channel Project will produce in Maryland waters; 41.2 mcy of material resulting from new work in the main ship channels and branch channels, and 6.3 mcy of material produced by 10 years of subsequent project maintenance dredging.

In addition to the Baltimore Fifty Foot Channel Project and the Hart-Miller Islands containment site, the MPA's Dredged Material Management Program is currently evaluating a range of options for disposal of dredged material. These options are being considered for the disposal of material presently being produced by projects other than the Baltimore Channel modification, and for the future disposal of Fifty Foot Channel Project maintenance material once the Hart-Miller Islands facility is full.

However, if these evaluations should indicate that some of the material scheduled to be dredged for the channel modification project could be conveniently disposed somewhere other than Hart-Miller, the state may choose to exercise that option and thus extend the useful operational life span of the Hart-Miller facility. It is important to note that the state is merely reserving for itself the flexibility to proceed with more than one disposal option at a time. It is not our intention to rescind this designation of the Hart-Miller site for use by the channel modification project, now or in the future.

It is my understanding that with this designation of the Hart-Miller containment facility, the State of Maryland has completed and satisfied all items for local cooperation required from the state in support of that portion of the Fifty Foot Channel Project located in Maryland waters. We are also in contact with our counterparts in the Commonwealth of Virginia, and are actively exploring all avenues to enable Virginia to provide, with all possible expediency, the necessary local assurances for that portion of the Baltimore Fifty Foot Channel Project which is located in Virginia waters. We will keep you advised of any and all developments.

If you have any questions concerning this designation, please do not hesitate to contact me, Port Administrator Halpin or his staff.

Sincerely,

James J. O'Donnell

James J. O'Donnell
Secretary

JJO'D:drb

c.c. Mr. W. Gregory Halpin

Enclosure

Maryland Department of Transportation
Maryland Port Administration

Hermann K. Intemann
Secretary
Joseph L. Stanton
Administrator

June 12, 1978

Colonel G. K. Withers
District Engineer
Corps of Engineers
U. S. Army Engineers District - Baltimore
Post Office Box 1715
Baltimore, Maryland 21203

Dear Colonel Withers:

In accordance with Section 101 of the River and Harbor Act of 1970, PL 91-611, and Section 221 of the Flood Control Act of 1970, PL 91-611, it is the intent of the State of Maryland that, if construction of the Baltimore Harbor and Channels (50') Project is commenced, the State shall:

a. Provide without cost to the United States all lands, easements, and rights-of-way required for construction and subsequent maintenance of the Project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of dredged material and necessary retaining dikes, bulkheads, and embankments therefor, or the costs of such retaining works;

b. Hold and save the United States free from damages that may result from the construction and maintenance of the project, except damages due to the fault of negligence of the United States or its contractors;

c. Provide and maintain at local expense adequate public terminal and transfer facilities open to all on equal terms, and depths in berthing areas and local access channels serving terminals commensurate with the depth provided in the related project areas;

d. Accomplish without cost to the United States such utility and other relocations or alterations as necessary for project purposes;

e. Prohibit erection of any structure within 125 feet of the project channel or turning basin;

f. Establish regulations prohibiting discharge of pollutants into waters of the channels and harbor by users thereof, which regulations shall be in accordance with applicable laws or regulations of Federal, State and local authorities responsible for pollution prevention and control;

g. Comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (PL 91-646, 84 Stat. 1894) and implementing regulations; and

h. Comply with Title VI of the Civil Rights Act of 1964 (PL 88 352, 78 Stat. 241).

Sincerely,

Hermann K. Intemann
Secretary

HKI:des

COMMENTS AND RESPONSES

COMMENT AND RESPONSE

A draft of this report, including the Main Report, EIS, and Technical Appendices, was coordinated with the public and Federal, State, and local government agencies. Following is a list of the comments received during the review process with the accompanying response. Letters from the non-Federal sponsor, the State of Maryland, were received from Office of the Governor and from the Maryland Department of Transportation. The remainder of the letters are presented in the order of Federal, State, and local agencies and public comments.

State of Maryland - Executive Office

COMMENT: Representatives of the Department of Natural Resources have forwarded to you Maryland's comments. At the same time, let me assure you of our emphatic support of this project and our willingness to provide you any information you feel may be necessary to get this proposal underway.

RESPONSE: No response is required.

Maryland Department of Transportation

COMMENT: In brief, we find that the report is comprehensive and well presented, and we offer our unqualified endorsement of this document.

The importance of the 50-foot channel project to the future of the Port of Baltimore could hardly be exaggerated if one tried. Its timely completion will represent one of the largest steps forward to occur within the recent history of the Port, enabling us to better serve the expanding economic interests of Baltimore and its surrounding areas as well as the maritime industry. We look forward to the early completion of this project.

RESPONSE: No response is required.

National Marine Fisheries Service

COMMENT: In reading Secretary O'Donnell's letter of 12 January 1981, and after discussion with Department of Transportation and Department of Natural Resources personnel, it appears there is the distinct possibility that the State of Maryland may propose to place approximately 27 million cubic yards of spoil material overboard. We are concerned that the DEIS has not discussed this alternative.

RESPONSE: The Maryland Department of Transportation has the responsibility of identifying an acceptable site for placement of dredged material from deepening the Maryland channels. Hart-Miller Islands have been identified and found to be acceptable. If the State proposes to use different or additional sites for deposition of material resulting from the deepening, then that site/sites would have to be analyzed, results coordinated, and determined to be acceptable. Appropriate environmental analysis and documentation would have to be prepared concerning any impacts which may occur.

COMMENT: The National Marine Fisheries Services (NMFS) was consulted during the planning stages of the proposed project. Resources for which NMFS bears a responsibility and alternatives to reduce adverse impacts on these resources have been addressed to our satisfaction in the Draft Environmental Impact Statement (DEIS).

RESPONSE: No response is required.

U.S. Fish and Wildlife Service

The Fish and Wildlife Service (FWS) has provided the Corps with a Fish and Wildlife Coordination Act Report, as required by provisions of the Fish and Wildlife Coordination Act, P.L. 85-624, Section 2(b). The report, which can be found in this Addendum, contains extensive discussion on the project. The two recommendations in the report are presented as follows.

COMMENT: The Corps should require the State of Maryland to develop a plan for spoil disposal over the 50 year project life. In order for the plan to be realistic, it should recognize that demands for spoil disposal sites will come not only from the main ship channel, but also from other Federal, State, and private dredging projects in the vicinity of Baltimore Harbor. In addition, alternative disposal methods for the relatively clean material from the deepening of the approach channel should be examined.

RESPONSE: The State of Maryland has the requirement to provide disposal areas for the project life. The State has identified Hart-Miller Islands as the site for placement of the initial dredged material from the Maryland channels and for a period of maintenance. In accordance with Corps' requirements, the State, which is aware of its responsibility to develop a program for disposal, is examining alternative disposal sites for acceptance of maintenance dredging. Maryland is aware of the need for dredged material placement from other Federal, State, and private dredging projects as well and is currently planning for these needs. Should Maryland identify alternative disposal methods for clean materials from deepening the approach channels, those plans would be reviewed and appropriate supplemental information developed. See response to National Marine Fisheries comment.

COMMENT: The Corps should fund studies to monitor the effects of the project. In the near future, we will be reviewing a program proposed by the Virginia Institute of Marine Science for the Virginia channels. The State of Maryland has been developing their own monitoring plan for the Hart-Miller disposal area.

RESPONSE: The Corps of Engineers, in conjunction with the Technical Advisory Group, is refining a plan which will monitor the effects of the project in Virginia. The total project cost reflects the costs of this monitoring funds as presented in Section O, Table O-8. The Maryland Department of Natural Resources, under Maryland legislation, is responsible for monitoring of dredging operations in Maryland. Department of Natural Resources, in conjunction with Maryland Department of Transportation, is developing a monitoring plan for construction and operation of Hart-Miller Islands.

U.S. Environmental Protection Agency

The Environmental Protection Agency provided a general letter and detailed comments. The letter may be found in this Addendum and the detailed comments and responses are provided here.

COMMENT: Baltimore Harbor, according to DEIS page 23 there would be a change in the Patapsco River salinity of greater than 5 ppt. A worst case scenario should be prepared which identifies what this means to the environment. This should include but not be limited to the following:

a. The impact of zoography (i.e., fish migration, boring and fouling organisms, shellfish).

b. The impact of submergent and emergent aquatic vegetation.

c. The potential release of pollutants from contaminated sediments.

d. Impacts to groundwater and surface water hydrology.

RESPONSE: The discussion of salinity changes has been elaborated upon in Section K of the Main Report and the FEIS. As mentioned in the FEIS, the salinity differences seem greatest (5 ppt) in the channel of the Patapsco. There is a reduced salinity response in the non-deepened side channels and adjacent areas.

While the greatest salinity increases are expected in the inner Baltimore Harbor, there is no spawning there and the fauna, especially the benthos is poorly developed. The deepened channels are where the major changes occur and these areas develop anaerobic conditions in the summer and consequently support a limited benthic community. Also, the channels are not located near submerged or emergent aquatic vegetation.

During the actual dredging process, sediments will be disturbed and suspended into the water column. The U.S. Army Waterways Experiment Station (WES) has investigated dredging and disposal operations for a number of years under the Dredged Material Research Program (DMRP). Results of the program have indicated that water column turbidity generated by dredging operations is usually restricted to the vicinity of the operation and decreases rapidly with increasing distance from the operation due to settling and horizontal dispersion of the suspended material. The main concern with the harbor dredging is not the resultant turbidity but the release of toxic material into the water column. The DMRP research indicates long-term impacts of dredged material on water quality have generally been slight. Very little net mass release of heavy metals into the water column was observed regardless of the composition of the sediments. Even during open water disposal operations, it was observed that there were essentially no uptake of metals or PCB's by fish or most invertebrates.

Chemical testing in the Baltimore Harbor shows that the portions of the sediments contaminated with the most polluted material to be in the inner harbor. The sediments become less contaminated as you approach the mouth of the Patapsco River. This contamination is substantially confined to the upper 10 centimeters of the sediment. The bulk of the dredged material will be undisturbed, clean material which results from deepening the channels. Dredging operations will remove most material, however, some sediment will be suspended into the water column. Since the most polluted material is in the inner harbor, any suspended material will have a longer time to settle out before it reaches the open bay. As dredging occurs closer to the mouth of the river, the settling time for suspended sediments before reaching the bay is shorter, however, the material being dredged is less contaminated. In addition, the material within the channels is probably less contaminated than material elsewhere in the harbor due to the fact that the channels have been deepened and maintained in the past. Also, the low velocities in the inner harbor somewhat limit the transport of the sediment. The amount of contaminated material being carried to the bay as a result of dredging operations is not expected to be significant.

Recent Environmental Protection Agency testing (1981) has shown an area adjacent to the mouth of the Patapsco River to contain contaminated material and is limited in its benthic diversity. Any suspended material resulting from dredging, which make it to the bay, may settle out in this area. If so, the overall impact to the area should not be significant.

The Maryland Department of Transportation, in regards to the study of the I-95 Tunnel, has determined that the groundwater in the harbor region is currently polluted with a salt water intrusion. Therefore, deepening the channels should not adversely affect any groundwater. Also, according to Dr. Boycourt's numerical model of the Baltimore Harbor (see Section K for further detail), deepening of the Baltimore Harbor and channels should not affect the fact that there is a three layered system. Overall velocities and salinities may increase somewhat, however, these should not affect the nature of the system. Also, Dr. Boycourt's model has shown that there will not be a significant increase in circulation or in sediment transport as a result of channel deepening.

COMMENT: The model also predicted lower velocities on page 23 within the Patapsco River. How was it determined that there would not be an increased need for maintenance dredging on page L-11?

RESPONSE: The determination that there would not be an increased need for maintenance dredging was based on past shoaling rates. Also, page 25 of the EIS does not predict lower velocities within the Patapsco River but does conclude that no major velocity variations were indicated as a result of channel deepening. Since there are no projected major variations in velocity occurring, it can be concluded that there would not be an increased need for maintenance dredging.

COMMENT: James and York Rivers, according to page 23 there would be a decrease in salinity. The impact of such a change should be identified.

a. The impact of zoography.

b. The impact of submergent and emergent vegetation.

c. The potential release of kepone in the James River.

RESPONSE: According to the model test results, the salinity decrease in the York and James Rivers were found at the mouth only and only at one of the two monitoring stations (see Section K, paragraph 102). If a change does occur, the effect on biota should not be significant. (See response to Commonwealth of Virginia - Council on the Environment). Also, according to tests performed by Virginia Institute of Marine Science, salinity changes do not affect the release of kepone.

COMMENT: The Hampton Roads is expected to be deepened to 55 feet. What effect will this channel deepening have upon the 50-foot channel to Baltimore, i.e., will it exacerbate potential salinity problems?

RESPONSE:- The deepening of the Hampton Roads Channels will be analyzed by the Norfolk District of the Corps of Engineers. Tests are planned to be conducted using the Chesapeake Bay Hydraulic Model to show the effects of deepening the Hampton Roads Channel. It is not known at this time whether the Hampton Roads deepening will accentuate or diminish any potential salinity changes that occur as a result of the Baltimore 50-foot deepening.

COMMENT: The Port of Baltimore is a major competition of Norfolk. Would this Federally supported project provide any unfair economic burden for one port over another?

RESPONSE: The benefits of deepening of Baltimore's shipping channels are savings in efficiency for shipping that presently occurs or is projected to occur without deepening the project. For further explanation of benefits derived from the project, see Section P of the Main Report.

COMMENT: The DEIS does not adequately address the 50 year maintenance problem. The Maryland report identified on page L-11 is outdated. At present with Hart-Miller Islands, a 50 year disposal site is available. A management program to maximize the use of Hart-Miller Islands must be developed. This would include the possible use of clean sand from the channels for industrial use and possible overboard disposal of the Craighill Sections where overboard sites are available and the materials meet the criteria.

RESPONSE: Although the report is outdated, it reflects a process to develop plans for identification and management of disposal areas. The State has identified Hart-Miller Islands as the site for placement of the initial dredged material from the Maryland channels and for a period of maintenance. The State has the responsibility to develop a program for disposal and is examining alternative disposal sites for acceptance of maintenance dredging.

COMMENT: The DEIS does not provide any details on the monitoring of the channel deepening. It is our understanding that the Virginia channels will be monitored under contract to Virginia Institute of Marine Science. We request that the Environmental Protection Agency be involved in the preparation of the monitoring plan and receive a copy of the monitoring reports. On the Maryland channels, the State will be conducting all monitoring. Again, we request the opportunity to participate in the monitoring program design and to receive copies of the reports.

RESPONSE: The details of the monitoring program are still being developed through the Technical Advisory Group of which the Environmental Protection Agency is a member. Determination as to contracting for monitoring has not been made at this time. The Environmental Protection Agency will continue to be requested to participate in the development of the monitoring program. The monitoring program for Maryland is being developed through the Department of Transportation and the Department of Natural Resources. The monitoring program will meet all conditions stipulated in all permits and certifications for the project. Any desire to help design the program will have to be coordinated with the State.

COMMENT: Two ocean dump sites have been identified. The Dam Neck site is the only approved site and is proposed to be phased out when the Norfolk site EIS is approved. The Environmental Protection Agency has recommended to the Office of the Chief of Engineers that both sites be approved for long-term disposal. The Dam Neck site would be used strictly for clean sand and the Norfolk Ocean site for all the other spoils which meet criteria. During the dredging of the Cape Henry and York Spit Channels, all clean sand should be dumped at the Dam Neck site.

RESPONSE: The Dam Neck site is currently being investigated to be used for a long-term disposal site for clean material (see Addendum II).

COMMENT: In those sections using a hopper dredge, no economic loading should be done. This will minimize the impacts at the dredging site.

RESPONSE: Continuing investigations of economic loading and potential impacts are being conducted. Economic loading is anticipated in the Virginia channels with potential impacts in the York and Rappahannock Channels being analyzed as part of the monitoring program.

U.S. Department of Agriculture

COMMENT: We have reviewed the Main Report and Draft Environmental Impact Statement for Baltimore Harbor and Channels, Maryland and Virginia, and have no substantive comments to make at this time. Thank you for the opportunity to review this draft EIS.

RESPONSE: No response is required.

Federal Emergency Management Agency

COMMENT: We have reviewed the above referenced report and have found no need to comment.

RESPONSE: No response is required.

Federal Energy Regulatory Commission

COMMENT: I am replying to your request on 29 May 1981 to the Federal Energy Regulatory Commission for comments on the Draft Environmental Impact Statement for the Baltimore Harbor and Channels 50-Foot Project, Maryland and Virginia. This Draft EIS has been reviewed by appropriate FERC staff components upon whose evaluation this response is based.

This staff concentrates its review on other agencies' environmental impact statements basically on those areas of the electric power, natural gas, and oil pipeline industries for which the Commission has jurisdiction by law, or where staff has special expertise in evaluating environmental impacts involved with the proposed action. It does not appear that there would be any significant impacts in these areas of concern nor serious conflicts with this agency's responsibilities should this action be undertaken.

RESPONSE: No response is required.

Commonwealth of Virginia - Council on the Environment

Comments from the following agencies were received through and summarized by the Commonwealth of Virginia Clearinghouse (Council on the Environment).

Commission of Game and Inland Fisheries
Commission of Outdoor Recreation
Department of Conservation and Economic Development
Department of Health
Department of Highways and Transportation
Division of Industrial Development
Marine Resources Commission
State Air Pollution Control Board
State Water Control Board
Office of Emergency and Energy Services
Virginia Port Authority

COMMENT: (As reflected by Virginia Port Authority)

The Commonwealth has a number of suggestions and concerns with respect to monitoring and testing needs, uses of the dredged material, and other aspects of the project. Basically, we will insist upon implementation and enforcement of the monitoring program outlined in the Commonwealth's letter, dated 24 April 1981, to the Honorable James T. O'Donnell, Maryland Secretary of Transportation (reprinted in Addendum II of the Main Report and Environmental Statement).

RESPONSE: A monitoring program is currently being developed through the Technical Advisory Group of which the State of Virginia is represented. An acceptable monitoring plan will be implemented prior to, during, and after disposal operations.

COMMENT: (As reflected by Virginia Marine Resources Commission)

The Commonwealth is concerned about the project's effects on Virginia's fulfillment of its water quality responsibilities. Since the project is statutorily exempt from the regulatory authority of the Marine Resources Commission and the Norfolk District of the Corps has waived interest, the only legal mechanism for protection of Virginia's interests will be the "401 Certification" issued by the State Water Control Board. Without the "401 Certification", Virginia's interests will be unprotected.

RESPONSE: Section 404(R) of the Clean Water Act of 1977 provides that is a 404(b)(1) evaluation of the effects of the discharge of dredged or fill material into the waters of the United States has been performed, as in the case of this EIS, that Congress could consider the effects of the discharge of dredged or fill material into waters of the United States through the authorization or appropriation processes for those projects specifically authorized by Act of Congress. Once the requirements of this option are met, the discharge is no longer subject to regulation under Section 301, 402, and 404 of the Clean Water Act, unless the location or method of discharge changes. If the 404(b)(1) evaluation is submitted to Congress for review, the requirement to obtain a State Water Quality Certificate, under Section 401 of the Clean Water Act is not applicable.

COMMENT: (As reflected by Virginia State Water Control Board and the Office of Health Protection and Environmental Management)

With respect to monitoring needs, it is by no means certain that previous use of the disposal areas of Wolf Trap, Rappahannock Shoal, and Dam Neck precludes changes in the biological communities from new dredging and use (Section 4.22, page 26 of EIS). This project will double the annual maintenance requirements in the Virginia channels; close monitoring of the effects of dredge spoil disposal will be necessary throughout the project. Monitoring should include consideration of water quality as well as biological communities; the program under development by the Technical Advisory Committee did not, according to the documents, include water quality. An additional reason for monitoring the disposal of dredged materials in Virginia waters is the increased maintenance requirement cited above.

Also, the following comment was received from the Virginia State Water Control Board.

COMMENT: A strong effort should be made to monitor the fate of the dredged materials placed in Virginia waters. Should this dredging be determined to increase the frequency of maintenance dredging in other channels or harbors, a system of compensation should be arranged to mitigate the resultant additional expenses to the local sponsors and the Norfolk District, Corps of Engineers.

RESPONSE: As stated previously, the Technical Advisory Group is currently developing an acceptable monitoring plan. Discussions are taking place to determine the specific parameters which will be monitored and the magnitude of the monitoring. Consideration is being given to the monitoring of certain water quality parameters. Another aspect of the monitoring plan being discussed is the fate of the dredged material. In addition to the placement of dredged material from initial construction, there will be an approximate doubling of materials from periodic maintenance. A significant portion of the monitoring program will be to baseline the biological conditions of the disposal areas, monitor the immediate and mid-term fate of dredged material, determine the impact upon the biological value of the disposal area. It is not anticipated that the movement of dredged material will increase the frequency of maintenance dredging in other channels or harbors.

COMMENT: (As reflected by comments from State Water Control Board and from the Marine Resources Commission)

The Commonwealth hopes for further expansion of the model testing for salinity differences associated with the Baltimore Channel deepening. We are concerned that a shift in the average salinity in either the Bay or its tributaries could adversely affect the living resources.

RESPONSE: A further explanation of the model test for salinity can be found in Section K, paragraph 99-104.

COMMENT: (As reflected by the Virginia Marine Resources Commission and the Department of Highways and Transportation)

Some of the dredged material might be put to practical use instead of being dumped overboard. The Department of Highways and Transportation should be contacted (see attached letter) if the idea of using dredged material as fill for its Route 664 (Hampton Roads) tunnel islands appears feasible to the Corps; the Department wishes to conduct tests on the material. Some of the dredged material might be used as beach nourishment. Disposal of material from the Cape Henry Channel should be coordinated with that of material from the Norfolk project if possible.

RESPONSE: The Commonwealth of Virginia has identified the stockpiling of acceptable material at the Ft. Story disposal site or an acceptable alternate in the designation of disposal sites for material from the Virginia channels. The use of Ft. Story for this purpose is reflected in the EIS. Coordination is currently underway with the Department of Highways and Transportation for their use of material in the Route 664 tunnel islands. The results of investigations for other uses for the dredged material, such as wetland creation, has been discussed in Sections I and K of the Main Report and also in the EIS.

COMMENT: Page K-9, paragraph 71 - The justification given to minimize the apparent impact seems specious. It would be more valid to compare the area disturbed to the area of the appropriate ecological zone of the Bay instead of the entire Chesapeake Bay.

RESPONSE: This paragraph is used as a comparison of the bay versus the new channel areas and not as a justification to minimize the apparent impact. It is recognized that three square miles of new bottom will be deepened; however, repopulation will occur which will lessen these impacts. The paragraph reflects maintenance dredging in the channel and recognizes that the channel area has lower productivity than in shallow areas. Since channel extensions do not pass through any critical habitat, submerged aquatic vegetation areas or commercial benthic areas, making a comparison to a more specific ecological zone is inappropriate.

COMMENT: Page K-20, paragraph 73 - The seasonal restriction to protect the blue crabs seems to be a reasonable precaution.

RESPONSE: The seasonal restriction is to protect overwintering blue crabs adjacent to the channels from sedimentation resulting from dredging. If it can be shown that dredging does not impact these crabs, the restriction may be eliminated.

Virginia Office of Health Protection and Environmental Management

COMMENT: The primary concerns of this bureau are in regard to the overboard discharge of dredged material into the Wolf Trap and Rappahannock sites. It is urged that close monitoring of the effects of dredged material disposal in these sites be carried out during all aspects of the project.

RESPONSE: See comment on monitoring from the Commonwealth of Virginia - Council on the Environment.

Virginia Marine Resources Commission

COMMENT: Any significant shift in the average salinity regime in either the tributaries or the Bay itself (is of concern). Such a shift could impact adversely the living resources over which management responsibility is exercised by this agency.

RESPONSE: The shift of average salinity in the bay proper and the tributaries is not considered significant. Although any shift may impact the living resources, the impact may be beneficial to some species, i.e., increased salinities may cause better oyster spat setting, and decreased salinities may restrict the oyster drill, MSX, and other pathogens.

Virginia Port Authority

COMMENT: The date shown on the first line of page 14 of Addendum I should be 1876 not 1976.

RESPONSE: The date has been changed to reflect the correct year which is 1907.

Virginia Conservation and Economic Development

COMMENT: From a geological standpoint, the report is well prepared and addresses all the pertinent geologic aspects. The disposal site for the Cape Henry Channel may be the same as proposed for the Norfolk-Hampton Road project. Disposal of dredged material from both of these projects should be coordinated.

RESPONSE: Coordination with the Norfolk District is on-going and will continue through the design and construction phases.

City of Virginia Beach

COMMENT: The City of Virginia Beach strongly supports the concept of placing as much of the suitable dredged material as possible at Fort Story for use in the City's continuing beach nourishment program as discussed on pages L-6 through L-8 of the report. Even though the estimated grain size may not be ideal, it would no doubt be as good as, or better than, much of the material placed on the beach from inland borrow pits in recent years.

Accordingly, it is requested that you give favorable consideration to the use of Fort Story as a disposal/stockpile area for the material to be dredged from the Cape Henry Channel. Suitable nourishment material is difficult to obtain even when it is available. Consequently, it would be a shame not to take advantage of this opportunity to obtain a substantial supply.

RESPONSE: Consideration for the use of Fort Story as a disposal/stockpile area for any acceptable material will continue.

Maryland Regional Planning Council

Note: Coordination by the Regional Planning Commission included coordination with Anne Arundel County, Baltimore City, Baltimore County, Carroll County, Harford County, and Howard County.

COMMENT: The board members recognized the economic importance of this project as evidenced by the very favorable cost/benefit ratio. They believe; however, that environmental risks associated with bucket and scow dredging of materials from Baltimore Harbor Channels should be avoided. Bucket and scow dredging currently underway in the Harbor should be studied, and its effects on water quality carefully considered before contractors bid on the dredging project. The costs of a cleaner dredging method should also be figured into an alternative cost/benefit ratio. If a more expensive method results in a still favorable cost/benefit ratio, user fees should be instituted to cover the additional cost. Regardless of the method chosen, careful monitoring and the willingness to interrupt dredging should water quality problems develop are very important.

RESPONSE: The options for method of dredging and placement of the dredged material at Hart-Miller Islands will be specifically determined during the development of plans and specifications. Within the options allowed, actual method of dredging will be determined by contract bids. Consideration will not preclude the use of hydraulic dredging, hopper dredges, or any other practicable means of dredging. The current cost estimates are based on bucket and scow since the depths near Hart-Miller prevent using hopper dredges as a sole method and the distance to Hart-Miller complicates hydraulic dredging. The effects of dredging on the water column has been further explained in Section K of the Main Report. Significant impacts are not anticipated with a bucket and scow operation. While turbidity at the actual dredging site is increased somewhat in comparison to other techniques, bucket and scow has the benefit of minimizing the incorporation of high water content and thereby can improve the management of the material at the disposal site. The State of Maryland has the responsibility for past operations, as well as research conducted by Waterways Experiment Station, indicates that disturbed sediments settle quickly and that little impact on water quality is distinguishable. In addition, velocities in the harbor area in particular are quite low and materials are unlikely to be moved from the site. Final specifications of the monitoring will be discussed between the Maryland Department of Transportation and the Maryland Department of Natural Resources.

COMMENT: The Advisory Board members also requested that more detail be provided regarding how the increased dredging rate will affect the use of the Hart-Miller Islands disposal site, what standards will be used to determine effluent limitations if water is discharged, and what authority the Department of Natural Resources will have to stop any part of the operation if standards are violated.

RESPONSE: According to the Maryland Department of Transportation, the Hart-Miller Islands disposal site can handle the increased dredging rate and still assure proper water quality standards of the effluent. The Department of Natural Resources' Water Quality Certification, issued to the State for Hart-Miller Islands indicates that the Water Resources Administration shall monitor water quality before, during, and after construction of the spoil disposal facility. Although no adverse effects are expected, if any do occur or if any State water quality standards are violated, the Water Resources Administration shall initiate an investigation to determine cause and undertake immediate enforcement actions.

Detailed monitoring plans are presently being developed by the State of Maryland and will be available to the public.

Maryland Department of State Planning

COMMENT: The State Clearinghouse has reviewed the above project. In accordance with the procedures established by the Office of Management and Budget Circular A-95, the State Clearinghouse received comments from the following:

Department of Transportation, Department of Agriculture, Department of Economic and Community Development including their Historical Trust Section, Kent County and Queen Anne's County noted that the statement appears to adequately cover those areas of interest to their agencies.

RESPONSE: No response is required.

COMMENT: Office of Environmental Programs noted (copy attached) that they have some concerns regarding the public necessity of the project since previous testimony indicates that a lack of onshore coal facilities is considered the major obstacle to the increase of coal shipments and since previous investigations raise questions as to the impact of the proposal on the water quality of the Bay. The Office recommended that the final EIS contain sufficient information to show that the benefit derived from the proposal compensate for the losses attributable to the changes in water quality.

RESPONSE: Benefits for the project are derived from the savings in efficiency for shipping that presently occurs or is projected. If coal shipments would remain at present levels, the project would still be economically justified. For further explanation, see Section P of the Main Report. Further information concerning impacts to water quality of the Bay from deepening the project may be found in Section K of the Main Report and in the FEIS under "Significant Resources".

Maryland Department of Natural Resources

The U.S. Army Corps of Engineers draft report, "Main Report and Environmental Statement, Baltimore Harbor and Channels, Maryland and Virginia," May 1981, has been reviewed by appropriate agencies of the Maryland Department of Natural Resources. Among the issues addressed were the predicted change in salinity and resultant ecological changes caused by the channel deepening. Based on our review, it is concluded that the projected changes pose no serious problems for the ecosystem of Chesapeake Bay or the Patapsco sub-estuary. In general, any environmental impacts associated with the project appear temporary in nature.

There are several areas of inquiry that should be clarified in the Main Report and Environmental Statement.

COMMENT: The DEIS is weak in its discussion of dredging methodologies. It states that dredging operations in Maryland are expected to occur with bucket and scow. However, there is no definitive statement on this matter; in fact, there is suggestion that dredging methodology will be decided by the contractor.

This point is raised because in a project of this magnitude, the dredging contractors may bid on "economic load" considerations. Impacts associated with some dredging methods may prove detrimental to both water quality and habitat. This issue should be addressed in the EIS.

RESPONSE: A discussion of the use of the bucket and scow may be found in the reponse to Maryland Regional Planning Council and expanded on in Section K of the Main Report. Also, the State of Maryland has not allowed economic loading to take place in State waters in the past. The cost estimates in the report are not based on economic loading. Contract specifications will make clear to bidders the conditions for accomplishing the work.

COMMENT: The report states that bulk chemical analyses, elutriate tests, and sediment analyses have been performed. The only information given in the report involves 15 samples analyzed by Virginia Institute of Marine Science in 1978. The EIS should include all sediment analysis used in the formulation of the report.

RESPONSE: Although only 15 sediment analyses are shown in the Technical Appendix as well as some elutriate tests, other sources were used to determine the degree of sediment contamination. Samples from a 1971 Environmental Protection Agency study indicated polluted sediments. Yearly testing of the approach channels to the harbor prior to maintenance dredging were also used to determine degree of contamination. These comparisons were considered adequate enough to determine the degree of contaminants in these sediments.

COMMENT: Although not specifically stated in the supporting document, informal information indicates that there are plans to "fast track" the dredging of Baltimore channels at a rate of 16-18 million cubic yards per year. At that rate, it is likely that the sluice gates will be needed to accommodate overflow. Therefore, the method of overflow treatment must be identified and a National Pollutant Discharge Elimination System permit must be obtained within the first two or three years of operation.

RESPONSE: The General Design Memorandum and Environmental Impact Statement are based on construction of the project in an approximate three year time schedule. Coordination with the Maryland Port Administration indicates water quality control can be achieved on that schedule. Since operation of the Hart-Miller disposal area is the responsibility of the State of Maryland, the methods of treatment and any required permits for treatment is a matter between departments of the State.

COMMENT: Page H-9 through 11. Several utilities belonging to the City of Baltimore and the Baltimore Gas and Electric Company will need to be relocated or deepened due to the proposed dredging. These parties should be apprised of the need for wetland licenses for emplacement of submarine utility crossings and should be urged to apply for the appropriate licenses/permits at the earliest opportunity.

RESPONSE: The Baltimore Gas and Electric Company and the City of Baltimore have been informed of the project and potential impacts to submerged equipment. It is their responsibility to apply for the wetland licenses. Coordination with these utility owners will be continued during preparation of plans and specifications to insure that relocations are accomplished in an orderly and timely fashion.

COMMENT: Page K-3, paragraph 11. The time period over which the 100 damaging storms occurred should be stated.

RESPONSE: The time period involved is recorded time in the bay area and has been incorporated.

COMMENT: Page K-4, paragraph 13. In Baltimore Harbor, there is a three layered circulation pattern. This should be included in the discussion.

RESPONSE: The Baltimore Harbor three layered system has been incorporated into this paragraph.

COMMENT: Page K-6, paragraph 21. Non-point sources of pollution should be mentioned.

RESPONSE: Concur, this has been incorporated.

COMMENT: Page K-7, paragraph 23. One pollutant mentioned in fourth sentence "ethion" is not a familiar word. Ethion is an organophosphate (pesticide).

RESPONSE: Concur, this has been incorporated.

COMMENT: The existing Maryland standards for DO should be specified.

RESPONSE: Concur, this has been incorporated.

COMMENT: Page K-9, paragraph 41. Omit the 2nd and 3rd sentences. Suggest that the 4th sentence be changed to read, "Relatively healthy plant populations are found in the eastern shore tributaries such as the Choptank, Nanticoke, and Chester Rivers." continue as written.

RESPONSE: Concur, this has been incorporated.

COMMENT: Page K-11, paragraph 52. "Heavy" runs of American and hickory shad are not in evidence. As a matter of fact, there is a shad harvesting prohibition in effect.

RESPONSE: Concur, this has been incorporated.

COMMENT: Page L-11, paragraph 19. The report cited, "Management Alternatives for Dredging and Disposal Activities in Maryland Waters" 1977 by the Department of Natural Resources is out of date. Some of the proposed disposal sites are no longer under consideration.

The Maryland Port Administration is responsible for spoil disposal site inventory, site capacity, and prioritization of disposal sites for future funding for port development. Additionally, dredging and spoil disposal requirements for port and port-related projects has been presented in a recent 5-year dredging program.

The Corps should contact the Maryland Port Administration for the most recent disposal site evaluations. Based on information received from the Maryland Port Administration, this section should be rewritten.

RESPONSE: See response to Environmental Protection Agency regarding the same subject for a more detailed explanation, however, the State has initiated an active program to manage dredged material and identify new areas for long range disposal options.

COMMENT: Page O-3, paragraph 6. Third sentence. The figure reference is in error, should be "Figure L-5".

RESPONSE: Concur, this correction has been incorporated.

COMMENT: Addendum I, page 1, paragraph 3. Lines 2-3. The responsibility for designating spoil sites for port development belongs to Maryland Department of Transportation. The Department of Transportation investigates and recommends funding for the acquisition of sites. Acquisition of sites, when funding is assured, is the responsibility of Maryland Port Administration and subject to Board of Public Works' approval.

RESPONSE: See comment and response from the Environmental Protection Agency concerning same subject.

COMMENT: Addendum I, page 17, paragraph 30. The Dredge Material Research Program did not study the spoil disposal problems of the Chesapeake Bay.

RESPONSE: Although the Dredge Material Research Program did not study the spoil disposal problem of the Bay, the research coming out of the program can be used to better manage and select disposal options for the Bay. The purpose of this section is to explain the program and present some of its findings.

COMMENT: Page EIS-25, paragraph 4.19. While a dredging window may be incompatible with the proposed "fast track" dredging, a schedule that would take into account chartered oyster bars is suggested.

RESPONSE: It has been determined that deepening the channel should not present any impacts to oyster bars. The only oyster bars in the vicinity of the channels are near the Craighill Channel. Since the sediments are clean and deepening should keep any turbidity and siltation confined to the channel, it was determined that a dredging window was not appropriate.

Maryland Department of Health

COMMENT: The work for which this EIS was prepared requires the issuance of a Water Quality Certification from this Department.

A public hearing was held on 24 June 1981. Testimony was received from various interested parties and the hearing record has been left open for a period of 30 days. Copies of the transcript of the hearing will be obtained for consideration by this office in the determination as to whether or not to issue a Water Quality Certification for the project.

RESPONSE: See response to comment from Commonwealth of Virginia - Council on the Environment, as reflected by Virginia Marine Resources Commission.

COMMENT: A Chesapeake Bay Hydraulic Model Investigation of the impact of the project on the Bay's hydrodynamics is currently being reviewed by the State. This hydraulic model study has received certain questions as to the impact of the proposal on the water quality of the Bay.

It is recommended that the final EIS contain sufficient information showing that the hydraulic model's findings are not valid or that the benefit derived from the project compensate for the losses attributable to the changes in water quality.

RESPONSE: The Hydraulic Model indicated no major velocity changes in the Bay and no major salinity changes in the bay proper. Salinity changes were noted at the mouth of the York and James Rivers and in the inner harbor of Baltimore. The discussion of salinity changes has been elaborated upon in Section K of the Main Report and the FEIS. Also, a general discussion may be found in the response to Environmental Protection Agency comment concerning this subject.

COMMENT: The question of public necessity becomes germane in view of the fact that testimony received at the hearing and at Congressional hearings indicated that the lack of adequate coal handling facilities onshore is considered to be the major obstacle to the increase in coal shipments from the Baltimore region.

RESPONSE: See response to comment from Office of Environmental Programs.

Citizens Program for the Chesapeake Bay, Incorporated

COMMENT: In the summary of the draft Environmental Impact Statement, it is noted that there are no major unresolved issues at this time. We believe that the issue of sediment toxicity and the attendant requirement for a carefully selected method of accomplishing the needed dredging is an unresolved issue.

RESPONSE: The EIS has been revised to show sediment toxicity and method of dredging as an area of concern. Additional discussion has been provided in Section K. While the exact method of dredging will be determined later, the analysis conducted to date indicates that the contaminated materials can be safely dredged and transported to the disposal area with any of the standard methods of dredging. The sediment in the harbor has been chemically tested and pollutants determined. The material will be placed in a confined disposal area which should prevent it from adversely affecting the open bay. Therefore, this concern has not been presented as an unresolved issue.

COMMENT: As an advisory committee to the EPA Chesapeake Bay Program, we are aware of some newly developed information which ought to be considered by the Corps in planning and carrying out the dredging project. The Chesapeake Bay Program commissioned two studies of Baltimore Harbor sediments, the results of which are currently available in draft form. Dr. Robert Huggett, at the Virginia Institute of Marine Science, analyzed harbor sediment samples for organic pollutants. Dr. George Helz, at the University of Maryland, analyzed sediment samples for trace metals. The findings of these two studies, which are too recent to have been included in your report, suggest to us that the dredging of Baltimore Harbor may have environmental impacts beyond those that are briefly alluded to in that report.

The purpose of this letter is to urge the Corps of Engineers to review the data generated by the Chesapeake Bay Program and to be prepared to select a dredging method - other than bucket and scow - and to develop a monitoring program that will be responsive to the very specialized conditions of Baltimore Harbor. Since actual dredging will not begin until 1983, there should be adequate time for a thorough analysis of the situation in light of the most recent technical findings.

RESPONSE: The Corps will review the new information and add its findings to our consideration in plans and specifications. Based on information to date, bucket and scow is an acceptable procedure and should be allowed as a technique for bidders. The development of an acceptable monitoring program is the responsibility of the State.

The Propeller Club of the United States

COMMENT: The Propeller Club of the United States, Port of Baltimore, on behalf of its more than 600 individual members, wishes to be on record as supporting the 50-foot channel proposed, which was the subject of a public meeting held 24 June 1981.

RESPONSE: No response is necessary.

The Jewish Vegetarian Society

COMMENT: The Jewish Vegetarian Society strongly declares its opposition to the dumping of spoils from bucket and scow dredging of the Baltimore Harbor onto Hart and Miller Islands in the Chesapeake Bay. We feel this will disrupt the habitat of wildlife, waterfowl, and fish for many miles around the area.

RESPONSE: The State of Maryland has identified Hart-Miller Islands as the site for containment of material dredged from the Maryland channels. Impacts associated with the construction and operation of the facility has been analyzed in the Hart-Miller Environmental Impact Statement (1976). The effluent from the site will meet State water quality standards and should not adversely impact the Bay.

COMMENT: Various letters were received from private citizens concerning the project. Comments were received from:

Jacquelyn E. Bader
Hazel Baure
Eric R. Carl
Alice Lagna
Bernard H. Lammers
Henry Laque
Albert J. Mattes
Clarence and Grace Rauscher
Henry Seim
Mrs. Louis Stabb
John and Susan Steele
Audrey H. Walter
Margaret Ziemann

Concerns were directed to the use of bucket and scow for dredging in Maryland channels and the use of Hart-Miller Islands as a disposal site.

RESPONSE: See previous comments concerning the use of bucket and scow and the use of Hart-Miller Islands.

Department of the Interior

COMMENT: The impacts associated with the disposal of spoil from the 50-foot channel deepening in Maryland have been largely dismissed by the statement that the spoil will be placed in the approved Hart and Miller facility. However, it should be pointed out that the project will result in the loss of spoil disposal capacity which could otherwise be used to accommodate the continuing heavy load of existing maintenance material. The 50-foot project and channel maintenance will cause the 1100 acre Hart and Miller facility to be filled within 13 years after the start of dredging. Since no suitable disposal sites have been designated to handle the maintenance dredging after Hart and Miller is filled, the project may be accelerating the need for a new disposal site. The result may be construction of additional containment sites with the concomitant loss of estuarine habitat in order to confine the polluted harbor spoil.

RESPONSE: See response to U.S. Fish and Wildlife Service comment regarding the same topic.

COMMENT: The report has failed to present a plan for the disposal of maintenance dredging material generated from the Maryland channels during the 50-year project life. As a consequence, future disposal options are being preempted. As currently proposed, Hart and Miller will be used to contain all of the dredge spoil from the 50-foot project, including the material from the outer approach channels which is largely uncontaminated natural material which could be handled with other forms of disposal (e.g., marsh creation, fill for harbor projects such as the I-95 tunnel or the Masonville terminal, or deposition overboard in selected areas of Chesapeake Bay). If a 50-year disposal plan were to be prepared, the advantages of retaining Hart and Miller for the more polluted spoils from the harbor would be more evident.

RESPONSE: See previous response.

COMMENT: The report has not adequately addressed the potential salinity changes which may be caused by the channel deepening. The results of the Bay Model tests should be discussed more fully, including quantitative changes, limitations of the model, comparison to existing mathematical models, and ecological implications.

RESPONSE: See response to Environmental Protection Agency comment concerning same topic.

COMMENT: Section K, paragraph 52. The spawning run of American shad has been drastically reduced in recent years causing the State of Maryland to introduce special fishery restrictions.

RESPONSE: Concur. This corrections has been incorporated.

COMMENT: Section K, paragraph 65. Although not stated, the list of species essentially comprises those included on the Department of the Interior list of threatened and endangered species which could occur in the general Chesapeake Bay area. However, the bog turtle has no Federal status as threatened or endangered.

RESPONSE: Although the bog turtle is not contained on the Federal list, it is on the State list of threatened and endangered species.

COMMENT: Section K, paragraph 84. It should be pointed out that the Dam Neck Disposal Area is likely to be phased out prior to the start of project construction. It will most likely be replaced by the Norfolk Disposal Area which is in the process of undergoing environmental baseline studies prior to being designated acceptable ocean disposal site by the Environmental Protection Agency.

RESPONSE: The Dam Neck Site is currently being investigated to be used for a long-term disposal site for clean material (see Addendum II).

COMMENT: Section L, paragraph 19. Many of the potential disposal sites listed from the report entitled "Management Alternatives for Dredging and Disposal Activities in Maryland Waters" will be unavailable for use. Four of the sites were dropped from consideration in the early planning stages by the State. The Colgate Creek site is being used for another project. Use of the Masonville site is likely to conflict with the proposed development of the marine terminal there.

RESPONSE: Concur. Table L-3 lists the sites which Maryland has inventoried during their study for additional sites and does not limit investigation to these sites.

COMMENT: EIS, paragraph 4.23. It seems unlikely that all of the dredged material will be transported out of the disposal sites in Virginia. This is indicated by the fact that the Wolf Trap site will probably have to be extended 3500 yards eastward to accommodate the accumulation of material.

RESPONSE: All of the material may not leave the site; however, this was presented as a worst case scenario. As part of the proposed monitoring plan, the fate of the dredged material is being investigated.

COMMENT: EIS, paragraph 4.26. Green and logerhead turtles may also occur in the construction areas on a transitory basis.

RESPONSE: Concur. This correction has been incorporated.

COMMENT: EIS, page 39. It is stated that chemical testing was not conducted for the Virginia channels and a portion of the Maryland channels. On the contrary, these channels were tested for selected chemicals as is pointed out later in the paragraph.

RESPONSE: Concur. The paragraph has been changed to reflect this comment.

U.S. Department of Agriculture

COMMENT: The Council on Environmental Quality regulations allow for the preparation of draft EIS's concurrently and integrated with environmental analyses and related surveys and studies (40 CFR 1502.25) and allow for any environmental document to be combined with any other agency document (40 CFR 1506.4); however, the EIS must stand on its own as an analytical document. As written, it is questionable whether or not this EIS is self-supporting. We recommend that some of the material presented in the Main Report be moved into the EIS, i.e., Addendum I, An Overview of Dredged Material Management in the Chesapeake Bay; Section P, Benefits; and Section G, Alternatives. This would strengthen the EIS.

RESPONSE: It is felt that the present EIS is a self-supporting document. Although the incorporation of the listed sections would strengthen the EIS, it is considered that this material is incorporated in the EIS by reference.

COMMENT: The statement in the Abstract for the EIS that "Since the depth for the channel has been determined, only alternative locations and methods for placement of dredged material were investigated," is in conflict with the material presented under the alternatives sections that discusses the plans for channel improvement. We recommend that the material under Section A, Plans Eliminated from Further Study on page EIS-10 be moved to Section L, Needs and Objectives of Action. This material could be included as a separate subheading. It is background and informational material that is not relevant to the title of the section where it now appears.

Another consideration regarding alternatives would be the presentation of various methods of dredging. If this has not been previously evaluated, it should be included as part of this statement.

RESPONSE: The statement in the Abstract refers to the investigations made during the preparation of this General Design Memorandum. The alternative section presents the plans investigated during the survey report, which was completed in 1969. Also, the option for method of dredging and placement of the dredged material will be specifically determined during the development of plans and specifications.

COMMENT: In Table EIS-2, Comparative Impacts of Alternatives, the column titled Economics does not contain any data.

RESPONSE: Concur. This has been corrected.

Virginia Institute of Marine Science

COMMENT: Because of the complexity of the Chesapeake Bay system, the scope of the proposed project and the relative paucity of information available with which impacts may be evaluated, it is our opinion that the monitoring program being finalized is essential to the project. In addition, flexibility should be built into the project plans in order to respond to the results of the monitoring if necessary.

RESPONSE: The monitoring program being developed will be implemented prior to, during, and after project construction. The monitoring program as well as project plans will be flexible enough so that any response which may be needed as a result of monitoring can be undertaken with minimal delay.

COMMENT: The potential adverse impacts to Bay biota as a result of the model-predicted salinity changes are not adequately discussed in the report. We are particularly concerned about the impacts which may occur in the middle reaches of the major tributaries in the Virginia portions of the Bay. This is particularly important with regard to shellfish and anadromous fish stocks.

RESPONSE: The report has been revised to include the potential effects of salinity and hydrodynamic changes in the Bay (see Section K, paragraph 1.01 to 1.09 of the Main Report).

COMMENT: Our other major concern stems from results of the EPA/Bay study which strongly suggest that the Baltimore Harbor/Patapsco systems may act as a source for heavy metals and toxic organic compounds. For example, the presence and concentrations of several polynuclear aromatics (PNA's) such as fluoranthene, chyrsene, benzo(a)pyrene and pyrene have been documented in surface sediments in the Maryland Bay stem and Baltimore Harbor/Patapsco. The gradients peak at the entrance to, and within the Patapsco/Baltimore Harbor and then taper off for the region of the Patuxent River. North of the Patapsco River entrance for concentrations drop off and then exhibit another peak near the C&D Canal (Huggett et al., EPA Chesapeake Bay Study).

In addition, the heavy metals on sediments as documented by Helz (EPA/Bay Study) show gradients suggesting the Patapsco/Baltimore system as a source.

The evidence thus far available from these analyses of toxics associated with sediments provide no basis for rejecting the hypothesis that the Patapsco/Baltimore system does not act as a source. This being the case, it is mandatory that the Corps of Engineers rigorously address the question, via a comprehensive analysis, whether and to what degree the proposed modifications in the harbor would change the sediment influx-efflux characteristics. Such analysis should include the effects of sediment resuspension into the water column from ships' propellors. The question should also be addressed as to whether the sediments from Baltimore Harbor should be treated as normal dredged material or contaminated waste relative to their disposal at Hart-Miller Islands.

RESPONSE: An explanation of the effects of dredging in the Patapsco River and subsequent suspension of material can be found in the response to EPA's comment concerning this area. Resuspension of sediment resulting from ships' propellors is an existing occurence. Deepening of the channel should not increase this occurence; however, after dredging the sediment being resuspended should be less polluted than present sediments. In addition, the Baltimore Harbor material is considered polluted and will be placed in a confined disposal area.

Although PNA's have been found in the surface sediments of the harbor, no guidelines have been established as to harmfull concentrations or their effect on aquatic organisms. Also, these can be a naturally occurring substance.

Department of Natural Resources

Comment: Issue 1. There is uncertainty as to the techniques which will be utilized during the dredging of the Baltimore Harbor portion of the Channel to control turbidity and toxic materials.

The Interstate Division for Baltimore City prepared a comprehensive (1979) environmental assessment for the environmental impacts associated with constructing the I-95 Fort McHenry Tunnel. This study found that a hydraulic cutter head dredge removing the surface sediments in the Fort McHenry area would raise the concentrations of the following constituents in the immediate vicinity of the cutting head by a factor of ten or more; these constituents being suspended sediment, ammonia, phosphorus, oil and greases, arsenic, cadmium, copper, lead, zinc, chlordane, DDT, kepone, mirex, and PCB's. Dilution in a mixing zone of 120 meters around the dredge resulted in concentrations within the range of ambient concentrations except for the following constituents: chlordane, DDT, mirex and PCB's. These four compounds are presently found in Baltimore Harbor at concentrations which exceed EPA water quality criteria.

The Corps' Main Report states that bucket and scow dredging techniques are expected to be used for the Maryland portion of the 50-foot channel. Bucket and scow operations may cause higher concentrations of suspended sediment, heavy metals, and organic chemicals when compared to other types of dredging operations. Because water quality criteria are already being exceeded within Baltimore Harbor for certain potentially toxic materials, the Department recommends that the Corps undertake an indepth analysis of dredging methodologies and associated water quality impacts for that portion of the channel project within Baltimore Harbor. The Corps should stipulate in its dredging contracts the dredging methodology which minimizes the suspension of bottom material in the column and which minimizes the concentrations of potentially toxic metals and organic chemicals.

RESPONSE: Impacts associated with channel deepening with respect to water quality has been further addressed in the Main Report and FEIS. A discussion of the impacts can be found in the response to comments by EPA and Maryland Regional Planning Council.

COMMENT: Issue 2. Even though there will be toxicological testing of the sediments there is concern over the potential impact of dredging on the biota of Baltimore Harbor.

The EPA Chesapeake Bay Program is funding bioassay studies of Baltimore Harbor sediment. The work is currently in progress at the EPA Corvallis, Oregon, lab and final reports are expected early this fall. In addition, the I-95 Fort McHenry Tunnel environmental assessment includes a literature review of the impacts of selected trace metals, organo-chlorine compounds and oil on representative vertebrate and invertebrate species.

The Department recommends that this information be used to assess the potential impact on toxic materials freed by the dredging operations on the biota of Baltimore Harbor and that the analysis be included in the final EIS.

RESPONSE: See response to EPA comment concerning the Patapsco River regarding the effects of dredging the polluted sediments. Also, it has been documented that finfish would avoid an area of disturbance, as with dredging, so any finfish in the Harbor should not be impacted. The benthic organisms in the Baltimore Harbor area is so depressed that no major impacts resulting from dredging should occur. In addition, the Corps will review the new information and consider its findings in development of plans and specifications.

COMMENT: Issue 3. There is concern that the 50-foot Channel Project will alter circulation and salinity patterns of the Patapsco River.

The draft results of the Corps' "Baltimore Harbor and Channel Deepening Study" indicated that increases of 5 to 10 parts per thousand in bottom water salinity may accompany the 50-foot Channel Project in Baltimore Harbor. This increase in salinity may enhance the stratification of the Patapsco River and result in an increase in the velocity of the outflowing middle layer of the Baltimore Harbor's three-layered flow systems.

The Corps' physical model, which was utilized to assess the salinity change accompanying the 50-foot Channel Project, could not accurately predict changes in the velocities of the Harbor's three layered flow system.

Drs. Boicourt and Olson of the Johns Hopkins University have developed a mathematical computer hydraulic model of Baltimore Harbor. This model could be used to predict changes in velocity and flow.

The Department recommends that the computer model of Baltimore Harbor be utilized to evaluate salinity and circulation changes accompanying the 50-foot Project. If significantly large increases in outward flow are predicted to occur, then mitigation measures could be developed to minimize exports of materials into the mainstem of the Bay. For example, the dredging schedule could be designed to complete all inner Harbor work prior to finishing the approach channel portions.

RESPONSE: Dr. Boicourt's model has been used to evaluate the effects of deepening the channels on salinity and velocity. This has been included in the FEIS and Section K of the Main Report. According to Dr. Boicourt's numerical model, the deepening should not effect the fact that there is a three-layered system. Overall velocities and salinities may increase somewhat; however, these should not affect the nature of the system. Also, Dr. Boicourt's model has shown that there will not be a significant increase in circulation or in sediment transport as a result of channel deepening.

7112 River Drive Road
Baltimore, Maryland 21219
July 21, 1981

Dear Sir,

The Chesapeake Bay model, the Roy Mann report, expert witnesses, ecological and economic studies have all shown that the proposed dike should not be built at Hart and Miller Islands.

BIG BUSINESS decided it belongs there.

So, unless the honesty and integrity of the proponents cause them to alter their plans, the dike will go in.
We also know that any spills or ruptures will ruin forever the ecosystem of the Bay, a beautiful and valuable part of Maryland. Therefore, the obvious conclusion is MONEY.

My questions are: how will property owners in the area be compensated, who will assume responsibility for damage, will emergency phone numbers be available. Have these questions been covered? These are just a few questions the "little people" would like addressed.

Mr. Mrs. Louis Staab
cc: Congressman Clarence Long

July 21, 1981

Mrs. Herman F. Bauer
1920 Wilson Point Road
Baltimore, Maryland 21220

Dear Colonel Peck

Last week my neighbors and I went to the Md. Academy of Sciences to see an exhibit about the Bay and also went aboard the NOA ship that is constantly monitoring and testing the Bay.

This ship held and untold number of sophisticated and expensive technological machines. We talked with a crew member and asked about the dredging and Hart-Miller dumping. He said that was politics and they knew nothing about it.

That sums up our problem. Time, energy, money, and reams of reports, yet no one pays any attention - least of all t[he] army Corps of Engineers, who are charged to do what is best for the environment and to give an unbiased decision.

After the Hart-Miller case and the marina in Middle River we all know what a joke that is.

All kinds of ballyhoo are fed by the media to people who have no interest in preserving the Bay or its tributaries, or who have been told what to think and say by the people who stand to gain from the dredging and diking. An awful lot of money would be spent on this project for many years, and for what purpose?

I don't have to tell you how unsou[nd] the dike will be + how harmful the

Mrs. Herman F. Bauer
1920 Wilson Point Road
Baltimore, Maryland 21220

digging and transporting the sludge will be to the whole upper Bay, not to mention the traffic, noise and smell. You've heard all the true reasons for not permitting it so many times.

But I never hear anyone mention that all the ships our harbor could handle were able to get in and out safely and our tonnage increases every year. The limited accessibility is due to inadequate and antiquated pier and loading facilities. Maintaining forty-two feet and upgrading the equipment is all that is needed.

Deeper dredging will harm all existing piers, buildings close to the water, and all beaches in the area which will be washed away to fill the channel. We have seen this happen before. So many people and businesses will suffer in many ways and only a very limited number will gain.

So please, since you have a second chance, support the environment. Our Bay is the most unique and precious of its kind in the whole world. The wrong decisions of a very few can ruin it forever.

Sincerely,
Hazel Bauer

July 23, 1981

Col. James Peck, District Engineer,
U.S. Army Corps of Engineers,
Dear Sir:

I have been very much against the dumping of harbor sludge at the Hart-Miller Island site for many reasons:

1.) I believe that no serious consideration has been given to any other site from the very beginning, over 10 years ago. The very valuable Dundalk Marine Terminal was built on filled in Patapsco River site. There is ample wasted open space on both sides of this site. It is adjacent to the channel to be dredged. What is wrong with this site?

2.) The C. J. Langenfelder Co., a politically influential contractor, bought these islands cheap with intention of huge profits in selling to the state. This is politically motivat

3.) Dumping poisonous waste sludge at these islands will spoil the only Baltimore County bay-front forever. It is presently a swimming-fishing-crabbing area accessible to thousands in the metropolitan Baltimore area.

4.) Congressman Long has unfairly been accused of being against harbor dredging. He is in favor of dredging but only against ruining the entire upper bay with harbor sludge, as are thousands of other concerned citizens.

5.) It is unfortunate that the voices of thousands of concerned citizens in this area cannot count against the stubborness of a federal agency whose mind was made up on this site from the very beginning and is not concerned with our waterfront.

Very truly concerned,
Henry Sein
3040 Lavender Ave., Baltimore, 21234.

Col. James Peck, District Engineer
U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203

July 20, 1981

Dear Col. Peck:

This is written to air deep concern for the planned dumping of spoil in dikes at Hart & Miller islands.

I am an engineer, small business man, and scout leader who has lived near the islands all my life. Since I was a boy in the 40's and 50's, I have been involved in construction projects on the water and am familiar with the way the elements affect marine construction here. There is no doubt in my mind; nor that of many others; some directly involved in this proposed project; that there will be breaks in the dike, leaks from barges and the dike, and all manner of spillage of spoil all over the area from the harbor to the islands. As a result of what is patently obvious to the residents of the area, my teenage sons insist that they spend more time than usual at the islands this year,"since this is the last year for the islands", (quote from my 12 year old). Is there no recourse for a person being ravaged like this? How do I answer my sons when they ask how this can happen, since it is so well understood by so many that this thing is folly? My boys have grown up with this controversy hanging over the one place in this area that they hold very dear. They've seen people they respect arguing very reasonably for an end to this whole thing; they've been taught that this is a government of, for, and by the people- not big business at the expense of people. The whole thing is being handled in a shoddy manner with evident lack of concern for the very real fears of the people involved.

A number of facets of the project raise objections which remain essentially unanswered:

The dike is to be, primarily, sand with some riprap covering on some faces- this will be resting on very, very unstable sand which in no way can be considered an appropriate foundation for such a mound. I do not believe it is possible for the dike to hold long enough to be filled, let alone to compact. Even if it should, by some great stroke of luck, last long enough to fill and compact; it would certainly erode and crumble from the natural forces at work in the region. Clearly, you intend to sacrifice the area for posterity!

The spoil is to be lifted by a process which is very messy, namely "bucket and scow", noone is sure what effect this will have on the whole upper bay. What dangers exist from the great number of barge trips involved in moving the spoil over this great distance from the harbor to the islands? What is the likelyhood of accidents such as barges colliding with each other, and boats; or overturning in storms, etc.?

What hazards to navigation are to be created as a result of this transformation; not to large vessels, but the myriad of pleasure boaters who use this area in one of the most popular areas of the bay?

What effects will this deepening of the harbor have on the rest of the bay?

What assurance do we have that the state has the resources to complete this project when the dike crumbles in some storm three years from now, and the present great demand for coal is replaced by something else, and financial pressures dictate a revision in priorities? We can forsee a big mess and a lot of name calling, and some retirements and dissociation with the whole mess when it is no longer possible to cover up the ill-conceived "engineering" and planning of this project.

How do you explain the need to do such a thing to such an area to the people it means so much to?

I sincerely doubt that there are answers to any of these questions, let alone all of them. If you can't satisfy the people of the region on all these counts, I believe you do the public you are sworn to serve, and yourself, a great disservice. I will predict that there will be considerable turmoil and, very likely, personal harm to some people involved in the project. Do not interpret the calm that you see now as a sign of passivity on the part of those affected, I feel that vigilante type justice may be thrust upon people who are constantly cheated by those who should be serving them. People have not forgotten that the majority of voters opted against the "parallel bay bridge", which our elected officials, in their infinite wisdom, saw fit to build anyway.

Sincerely:

Eric R. Carl

Eric R. Carl
2118 Tred Avon Road
Baltimore, Maryland 21221

cf:
Rep. Clarence D. Long
Sen. Charles McC. Mathias
Sen. Paul S. Sarbanes
The Baltimore Sun
The Essex Times

Aug. 4, 1981

Col. James Peck
U. S. Army Corps. of Eng.
P. O. Box 1715
Baltimore, Md. 21203

Dear Sir:

I have been a lifetime resident of the upper Chesapeake bay tributaries and deeply oppose the use of Hart-Miller Islands for a dumping site for the harbor spoil.

Years ago the upper bay was plentiful with oysters. All the oysters are dead to-day because of dredging material dumped in the bay. Should we sit still and let the upper bay be ruined more by toxic waste? We can still eat the fish and crabs caught in the area. Will we be able to if Hart-Miller Island is used for a dumping site? We can eat the fish and crabs, can we eat coal?? I fear, once we ruin the upper bay of its riches, we may never get it back.

I can understand the problem of the harbor but why can't they find another site inland, use dumptrucks to haul away, keep local people in work and preserve our bay.

We are jeopardizing one multi-million dollar industry for another whereas we can ha[illegible] both if we use our heads.

Your sincere consideration in this matter will be greatly appreciated by all the thousands of people working on or using the bay.

Respectively yours,

Alice Lagna
913 Seneca Park Rd.
Balto. Md. 21220

Mr + Mrs. John R. Steele
Essex, Md.
Aug. 2, 1981.

U.S. Army Corps of Engrs.
Col. James Peck.

To turn Hart and Miller Island into a toxic dumping ground would be a regretful act. You and your corps would be destroying Essex's and Middle River's last primitive resort. Don't try to defend the act by telling use they are eroding. At least erosion is a natural act. We could live with that sort of destruction.

We cannot live with toxic fumes and unsafe water. The chance of spoil being spilled is too great for all organisms.

This has been a controversy for ten or so years. We are sure you will regard this as just another letter.

Just keep in mind, we have to live with the fumes and spoils resulting from the dike. Can you turn your back on that?

Probably. We imagine you to live several miles away with a pool in your back yard.

Don't let this happen
to our back yard.

Sincerely,
John R. Steele
Susan J. Steele

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER-81/1162

JUL 17 1981

Lieutenant General J. K. Bratton
Chief of Engineers
Department of the Army
Washington, D.C. 20314

Dear General Bratton:

The Department of the Interior has reviewed the Main Report and Environmental Statement for Baltimore Harbor and Channels, Maryland and Virginia. We have the following general and specific comments.

General Comments

The impacts associated with the disposal of spoil from the 50 foot channel deepening in Maryland have been largely dismissed by the statement that the spoil will be placed in the approved Hart and Miller facility. However, it should be pointed out that the project will result in the loss of spoil disposal capacity which could otherwise be used to accommodate the continuing heavy load of existing maintenance material. The 50 foot project and channel maintenance will cause the 1100 acre Hart and Miller facility to be filled within 13 years after the start of dredging. Since no suitable disposal sites have been designated to handle the maintenance dredging after Hart and Miller is filled, the project may be accelerating the need for a new disposal site. The result may be construction of additional containment sites with the concommitant loss of estuarine habitat in order to confine the polluted harbor spoil.

The report has failed to present a plan for the disposal of maintenance dredging material generated from the Maryland channels during the 50 year project life. As a consequence, future disposal options are being preempted. As currently proposed, Hart and Miller will be used to contain all of the dredge spoil from the 50 foot project, including the material from the outer approach channels which is largely uncontaminated natural material which could be handled with other forms of disposal (e.g., marsh creation, fill for harbor projects such as the I-95 tunnel or the Masonville terminal, or deposition overboard in selected areas of Chesapeake Bay). If a 50-year disposal plan were to be prepared, the advantages of retaining Hart and Miller for the more polluted spoils from the harbor would be more evident.

The report has not adequately addressed the potential salinity changes which may be caused by the channel deepening. The results of the Bay Model tests should be discussed more fully, including quantitative changes, limitations of the model, comparison to existing mathematical models, and ecological implications.

Specific Comments

Section K, paragraph 52. The spawning run of American shad has been drastically reduced in recent years causing the State of Maryland to introduce special fishery restrictions.

Section K, paragraph 65. Although not stated, the list of species essentially comprises those included on the Department of the Interior list of threatened and endangered species which could occur in the general Chesapeake Bay area. However, the bog turtle has no Federal status as threatened or endangered.

Section K, paragraph 84. It should be pointed out that the Dam Neck Disposal Area is likely to be phased out prior to the start of project construction. It will most likely be replaced by the Norfolk Disposal Area which is in the process of undergoing environmental baseline studies prior to being designated as an acceptable ocean disposal site by the Environmental Protection Agency.

Section L, paragraph 19. Many of the potential disposal sites listed from the report entitled "Management Alternatives for Dredging and Disposal Activities in Maryland Waters" will be unavailable for use. Four of the sites were dropped from consideration in the early planning stages by the State. The Colgate Creek site is being used for another project. Use of the Masonville site is likely to conflict with the proposed development of a marine terminal there.

EIS, paragraph 4.23. It seems unlikely that all of the dredged material will be transported out of the disposal sites in Virginia. This is indicated by the fact that the Wolf Trap site will probably have to be extended 3500 yards eastward to accommodate the accumulation of material.

EIS, paragraph 4.26. Green and loggerhead turtles may also occur in the construction areas on a transitory basis.

EIS, page 39. It is stated that chemical testing was not conducted for the Virginia channels and a portion of the Maryland channels. On the contrary, these channels were tested for selected chemicals as is pointed out later in the paragraph.

Thank you for the opportunity to comment on this proposal.

Sincerely,

Acting
Deputy Assistant SECRETARY

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

P.O. Box 2417
Washington, D.C. 20013

1950

July 27, 1981

Mr. William E. Trieschman, Jr.
Chief, Planning Division
Corps of Engineers
Box 1715
Baltimore, MD 21203

Dear Mr. Trieschman:

We are submitting the following comments on the Main Report and Draft Environmental Impact Statement for Baltimore Harbor and Channels.

The Council on Environmental Quality regulations allow for the preparation of draft EIS's concurrently and integrated with environmental analyses and related surveys and studies (40 CFR 1502.25) and allow for any environmental document to be combined with any other agency document (40 CFR 1506.4); however, the EIS must stand on its own as an analytical document. As written, it is questionable whether or not this EIS is self-supporting. We recommend that some of the material presented in the Main Report be moved into the EIS, i.e., Addendum I, An Overview of Dredged Material Management in the Chesapeake Bay; Section P, Benefits; and Section G, Alternatives. This would strengthen the EIS.

The statement in the Abstract for the EIS that "Since the depth for the channel has been determined, only alternative locations and methods for placement of dredged material were investigated," is in conflict with the material presented under the alternatives section that discusses the plans for channel improvement. We recommend that the material under Section A, Plans Eliminated from Futher Study on page EIS-10 be moved to Section 1, Needs and Objectives of Action. This material could be included as a separate subheading. It is background and informational material that is not relevant to the title of the section where it now appears.

Another consideration regarding alternatives would be the presentation of various methods of dredging. If this has not been previously evaluated, it should be included as part of this statement.

In Table-EIS-2, Comparative Impacts of Alternatives, the column titled Economics does not contain any data.

Thank you for the opportunity to review this Main Report and Draft Environmental Impact Statement.

Sincerely,

David E. Ketcham

DAVID E. KETCHAM
Director of
Environmental Coordination

COMMONWEALTH *of* VIRGINIA

Council on the Environment

J.B. JACKSON, JR.
ADMINISTRATOR

903 NINTH STREET OFFICE BUILDING
RICHMOND 23219
804-786-4500

July 21, 1981

Mr. William E. Trieschman, Jr.
Chief, Planning Division
Baltimore District, Army Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203

Dear Mr. Trieschman:

The Virginia Institute of Marine Science has sent comments on the Baltimore Harbor and Channels 50-Foot Project which did not arrive in time for inclusion in our letter to you of July 14.

The Institute points out that the Draft Environmental Impact Statement (Main Report and Technical Appendices) does not adequately discuss the effects of salinity changes attributable to the project upon Chesapeake Bay biota. Secondly, the monitoring program being developed is essential to the project because of the project's scope, the complexity of the Bay, and the relative dearth of available information with which to evaluate project impacts.

The Institute also urges rigorous analysis of the effects of the project upon the movement of sediments, inasmuch as the EPA Chesapeake Bay Study suggests that the Baltimore Harbor/Patapsco River system may be a source for toxic organic compounds and heavy metals.

Please add this letter and the enclosed letter from the Institute to the correspondence we sent you on July 14.

Sincerely,

J.B. Jackson, Jr.

Enclosure
cc: The Honorable Maurice B. Rowe, Secretary of Commerce and Resources
Mr. R. Todd Coyle, Virginia Port Authority
Mr. Norman E. Larsen, Marine Resources Commission
Mr. Raymond E. Bowles, State Water Control Board
Dr. Robert B. Stroube, Department of Health
Mr. Robert L. Hundley, Department of Highways and Transportation
Mr. Bruce B. Meador, Department of Conservation and Economic Development
Mr. Thomas A. Barnard, Jr., Virginia Institute of Marine Science

JBJ/CHE/all

CHARTERED 1693
COLLEGE OF WILLIAM AND MARY
VIRGINIA INSTITUTE OF MARINE SCIENCE
SCHOOL OF MARINE SCIENCE

July 16, 1981

Gloucester Point, Virginia 23062
Phone (804) 642-2111

Charles H. Ellis, III
Environmental Impact Statement Coordinator
Council on the Environment
903 Ninth Street Office Building
Richmond, Virginia 23219

Re: Baltimore Harbor and Channels, Maryland and Virginia. Draft EIS.

Dear Mr. Ellis:

We have reviewed the subject document from a marine environmental viewpoint and would like to make the following comments.

This draft report is much improved over the preliminary document which we reviewed and commented on previously (Letter dated 2 August 1979). We wish to state several concerns regarding this project, some we have stated before and one which recent investigations have only now brought to light.

Because of the complexity of the Chesapeake Bay system, the scope of the proposed project and the relative paucity of information available with which impacts may be evaluated, it is our opinion that the monitoring program being finalized is essential to the project. In addition, flexibility should be built into the project plans in order to respond to the results of the monitoring if necessary.

The potential adverse impacts to Bay biota as a result of the model-predicted salinity changes are not adequately discussed in the report. We are particularly concerned about the impacts which may occur in the middle reaches of the major tributaries in the Virginia portions of the Bay. This is particularly important with regard to shellfish and anadromous fish stocks.

Our other major concern stems from results of the EPA/Bay study which strongly suggest that the Baltimore Harbor/Patapsco systems may act as a source for heavy metals and toxic organic compounds. For example, the presence and concentrations of several polynuclear aromatics (PNA's) such as fluoranthene, chrysene, benzo(a)pyrene and pyrene have been documented in surface sediments in the Maryland Bay stem and Baltimore Harbor/Patapsco. The gradients peak at the entrance to, and within the Patapsco/Baltimore Harbor and then taper off for the region of the Patuxent River. North of the Patapsco River entrance the concentrations drop off and then exhibit another peak near the C & D Canal (Huggett et al., EPA Chesapeake Bay Study).

In addition, the heavy metals on sediments as documented by Helz (EPA/Bay Study) show gradients suggesting the Patapsco/Baltimore system as a source.

The evidence thus far available from these analyses of toxics associated with sediments provide no basis for rejecting the hypothesis that the Patapsco/Baltimore system does act as a source. This being the case, it is mandatory that the Corps of Engineers rigorously address the question, via a comprehensive analysis, whether and to what degree the proposed modifications in the harbor would change the sediment influx-efflux characteristics. Such analysis should include the effects of sediment resuspension into the water column from ships' propellors. The question should also be addressed as to whether the sediments from Baltimore Harbor should be treated as normal dredged material or contaminated waste relative to their disposal at Hart-Miller Island.

Thank you for the opportunity to participate in this review. These comments have been prepared by a task force of scientists at the Institute including Dr. Frank Perkins, Acting Director; Dr. Michael Bender, Head of the Division of Environmental Science and Services; Dr. Robert Huggett, Head of the Department of Ecology-Pollution; and Dr. Robert Byrne, Head of the Department of Geological Oceanography. We will be happy to answer any questions which may come up.

Sincerely yours,

Thomas A Barnard Jr.

Thomas A. Barnard, Jr.
Assoc. Marine Scientist

TAB/nw

cc: Drs. Perkins
Bender
Huggett
Byrne
File

JAMES B. COULTER
SECRETARY

STATE OF MARYLAND
DEPARTMENT OF NATURAL RESOURCES
TAWES STATE OFFICE BUILDING
ANNAPOLIS 21401

LOUIS N. PHIPPS, JR.
DEPUTY SECRETARY

(301) 269-3041

July 22, 1981

Colonel James W. Peck
District Engineer
P.O. Box 1715
Baltimore, Maryland 21203

Dear Colonel Peck.

The Department has reviewed the major environmental issues raised at the 24 June 1981 public hearing on the draft report entitled: "Main Report and Environmental Statement, Baltimore Harbor and Channels, Maryland and Virginia." The following comments are submitted for the record as relevant to those issues raised which concern turbidity and toxic materials, toxicological testing, and modification of the Patapsco River's circulation.

Issue 1. There is uncertainty as to the techniques which will be utilized during the dredging of the Baltimore Harbor portion of the Channel to control turbidity and toxic materials.

The Interstate Division for Baltimore City prepared a comprehensive (1979) environmental assessment for the environmental impacts associated with constructing the I-95 Fort McHenry Tunnel. This study found that a hydraulic cutter head dredge removing the surface sediments in the Fort McHenry area would raise the concentrations of the following constituents in the immediate vicinity of the cutting head by a factor of ten or more; these constituents being suspended sediment, ammonia, phosphorus, oil and grease, arsenic, cadmium, chromium, copper, lead, zinc, chlordane, DDT, kepone, mirex and PCB's. Dilution in a mixing zone of 120 meters around the dredge resulted in concentrations within the range of ambient concentrations except for the following constituents: chlordane, DDT, mirex and PCB's. These four compounds are presently found in Baltimore Harbor at concentrations which exceed EPA water quality criteria.

The Corps' Main Report states that bucket and scow dredging techniques are expected to be used for the Maryland portion of the 50-foot channel. Bucket and scow operations may cause higher concentrations of suspended sediment, heavy metals and organic chemicals when compared to other types of dredging operations. Because water quality criteria are already being exceeded within Baltimore Harbor for certain potentially toxic materials, the Department recommends that the Corps undertake an indepth analysis of dredging methodologies and associated water quality impacts for that portion of the channel project within Baltimore Harbor. The Corps should stipulate in its dredging contracts the dredging methodology which minimizes the suspension of bottom material in the column and which minimizes the concentrations of potentially toxic heavy metals and organic chemicals.

Issue 2. Even though there will be toxicological testing of the sediments there is concern over the potential impact of dredging on the biota of Baltimore Harbor.

The EPA Chesapeake Bay Program is funding bioassay studies of Baltimore Harbor sediment. The work is currently in progress at the EPA Corvallis, Oregon lab and final reports are expected early this fall. In addition, the I-95 Fort McHenry Tunnel environmental assessment includes a literature review of the impacts of selected trace metals, organo-chlorine compounds and oil on representative vertebrate and invertebrate species.

The Department recommends that this information be used to assess the potential impact of toxic materials freed by the dredging operations on the biota of Baltimore Harbor and that the analysis be included in the final EIS.

Issue 3. There is concern that the 50-foot Channel Project will alter circulation and salinity patterns of the Patapsco River.

The draft results of the Corps' "Baltimore Harbor and Channel Deepening Study" indicated that increases of 5 to 10 parts per thousand in bottom water salinity may accompany the 50-foot Channel Project in Baltimore Harbor. This increase in salinity may enhance the stratification of the Patapsco River and result in an increase in the velocity of the out-flowing middle layer of the Baltimore Harbor's three-layered flow systems.

The Corps physical model, which was utilized to assess the salinity changes accompanying the 50-foot Channel Project, could not accurately predict changes in the velocities of the Harbor's three layered flow system.

Drs. Boicourt and Olson of the Johns Hopkins University have developed a mathematical computer hydraulic model of Baltimore Harbor. This model could be used to predict changes in velocity and flow.

The Department recommends that the computer model of Baltimore Harbor be utilized to evaluate salinity and circulation changes accompanying the 50-foot Project. If significantly large increases in outward flow are predicted to occur, then mitigation measures could be developed to minimize exports of materials into the mainstem of the Bay. For example, the dredging schedule could be designed to complete all inner Harbor work prior to finishing the approach channel portions.

Sincerely,

James B. Coulter

James B. Coulter

JBC/dlk

COMMENTS RECEIVED FROM PUBLIC

STATE OF MARYLAND
EXECUTIVE DEPARTMENT
ANNAPOLIS, MARYLAND 21404

HARRY HUGHES
GOVERNOR

July 21, 1981

Colonel James W. Peck
Corps of Engineers
Department of the Army
Baltimore District
P.O. Box 1715
Baltimore, Maryland 21203

Dear Colonel Peck:

Thank you very much for your letter enclosing a copy of the Main Report, including the Draft Environmental Impact Statement and Technical Appendices for the Baltimore Harbor and Channels 50-Foot Project, Maryland and Virginia.

Representatives of the Department of Natural Resources have forwarded to you Maryland's comments. At the same time let me assure you of our emphatic support for this project and our willingness to provide you any information you feel may be necessary to get this proposal underway.

Sincerely,

Harry Hughes

Governor

Maryland Department of Transportation
Maryland Port Administration

James J. O'Donnell
Secretary
W. Gregory Halpin
Port Administrator

July 24, 1981

Colonel James W. Peck
District Engineer
Baltimore District
Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203

Dear Colonel Peck:

We sincerely thank you for the opportunity to review the "Main Report and Environmental Statement" for the Baltimore Harbor 50' Channel project. In brief, we find that the report is comprehensive and well presented, and we offer our unqualified endorsement of this document.

The importance of the 50' Channel project to the future of the Port of Baltimore could hardly be exaggerated if one tried. Its timely completion will represent one of the largest steps forward to occur within the recent history of the Port, enabling us to better serve the expanding economic interests of Baltimore and its surrounding areas as well as the maritime industry. We look forward to the early completion of this project.

Sincerely,

W. Gregory Halpin
Port Administrator

WGH:drb

My Telephone Number is (301) – 659-4500

The World Trade Center Baltimore, Baltimore, Maryland 21202

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Services Division
Habitat Protection Branch
7 Pleasant Street
Gloucester, Massachusetts 01930

1 6 JUL 1981

Col. James W. Peck
District Engineer
Department of the Army
Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203

Dear Colonel Peck:

The National Marine Fisheries Service (NMFS) has reviewed the Draft Environmental Impact Statement -- Baltimore Harbor and Channels 50-Foot Project, Maryland and Virginia.

In order to provide as timely a response to your request for comments as possible, we are submitting the enclosed comments to you directly, in parallel with their transmittal to the Department of Commerce for incorporation in the Departmental response. These comments represent the views of the NMFS. The formal, consolidated views of the Department should reach you shortly.

Sincerely,

Ruth Rehfus

Ruth O. Rehfus
Acting Branch Chief

Enclosure

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Services Division
Habitat Protection Branch
7 Pleasant Street
Gloucester, Massachusetts 01930

1 6 JUL 1981

TO: PP/EC - Joyce M. Wood

FROM: F/NER54 - Ruth O. Rehfus Ruth Rehfus

SUBJECT: Draft Environmental Impact Statement -- Baltimore Harbor and Channels 50-Foot Project, Maryland and Virginia

The National Marine Fisheries Service (NMFS) was consulted during the planning stages of the proposed project. Resources for which NMFS bears a responsibility and alternatives to reduce adverse impacts on these resources have been addressed to our satisfaction in the Draft Environmental Impact Statement (DEIS).

However, in reading Secretary O'Donnell's letter of January 12, 1981, and after discussions with Department of Transportation and Department of Natural Resources personnel, it appears there is the distinct possibility that the State of Maryland may propose to place approximately 27 million cubic yards of spoil material overboard. We are concerned that the DEIS has not discussed this alternative.

CLEARANCE | SIGNATURE AND DATE:

F/HP:R. Smith ______________________ ______________

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

DIVISION OF ECOLOGICAL SERVICES
1825B Virginia Street
Annapolis, Maryland 21401
July 23, 1981

Colonel James W. Peck
Baltimore District, Corps of Engineers
P.O. Box 1715
Baltimore, MD 21203

Dear Colonel Peck:

This letter constitutes the report of the U.S. Fish and Wildlife Service on the Baltimore Harbor and Channels 50 foot project, Maryland and Virginia. It is submitted in accordance with provisions of the Fish and Wildlife Coordination Act, P.L. 85-624 Section 2(b). We have previously provided comments on the project by our letters of December 23, 1977, March 13, 1978, September 6, 1978, and September 6, 1979. We have recently reviewed the draft of the combined phase I and II general design memorandum and the draft environmental statement and our comments will be submitted to you in a collective response from the Department of the Interior.

The project involves increasing from 42 to 50 feet the depth of the channel leading from the mouth of the Chesapeake Bay in Virginia to Baltimore Harbor in Maryland. In the Maryland section approximately 41 million cubic yards (mcy) of dredged material will be removed and placed in the Hart and Miller diked disposal site. In the Virginia channels approximately 31 mcy of material will be dredged and deposited in two open water sites in the Chesapeake Bay and an EPA certified ocean disposal site.

The Chesapeake Bay is the largest estuary in the United States. It is well known for its bountiful production of seafood, particularly blue crabs, oysters and clams. It provides important spawning, nursery and foraging habitat for many species of fish. Many Atlantic Coast species of both sport and commercial importance utilize Chesapeake Bay waters during parts of their life cycle. The Bay is also a major overwintering area for migratory waterfowl.

While the Bay as a whole is currently in good condition, it is being subjected to increasing stresses exerted by an expanding human population. Over the last decade serious declines have been noted in the populations of striped bass and American shad, oyster recruitment, and in the beds of submerged aquatic vegetation. Baltimore Harbor has been badly polluted for many years. However, in recent years water quality has noticeably improved, although the bottom sediments remain heavily contaminated with a variety of pollutants.

The impacts of the project can be divided into two categories, dredging impacts and disposal impacts. The most obvious dredging impact is the loss of the invertebrate benthic community in the channel. Repopulation should be well under way within a year, but the species composition of the repopulated community may be altered, particularly in those sections of the Virginia channels which have not been dredged before. The real value of the benthos lies in their role as a food source for higher organisms, especially fish, but it is not possible to foretell if the repopulated community will more or less valuable. Benthos adjacent to the channel could be affected by light burial by sediment overflowing from the hopper dredges as a result of economic loading, but this should be a relatively minor impact. The dredging in the Cape Henry and York Spit channels could impact blue crabs which migrate to the lower Bay for spawning and overwinter in the deep waters. We have recommended that no dredging take place in the Cape Henry and York Spit channels from November 15 to March 15 in order to avoid impacting the concentrations of blue crabs which occur there during this period. Accordingly, the Corps has incorporated this into their dredging schedule.

In the Virginia channels the dredging will create a plume of turbid water around the dredge. In the surface waters this will be due to sediment laiden water overflowing from the hopper, while in the bottom waters this will arise from the action of the cutterhead. Although the elevated levels of suspended sediments may be detrimental to some sensitive organisms, the plume should be free from any toxic chemical fractions and be relatively local in extent. Consequently, it will probably not have much biological effect.

In Maryland previous monitoring studies have found that the turbidity plume was accompanied by a small decrease in dissolved oyxgen, but otherwise was temporary and without significant adverse consequence. However, unlike the sediments in the previous studies, the sediments in Baltimore Harbor are contaminated with a variety of toxic pollutants. The resuspension and oxidation of the sediments could cause some deterioration of the water quality within Baltimore Harbor. There is also a possibility that contaminated Harbor Sediments which are disturbed during dredging may be carried out into Chesapeake Bay. Because of the relatively sluggish currents in Baltimore Harbor and the relatively long distance the more polluted sediments would have to travel before they reached the Bay, we don't think this is a major concern. As an additional precaution consideration might be given to starting dredging in the Inner Harbor area and progressing down the river to the Bay. This may deter the movement of sediments down the river and if some sediments did move down the channels, they would be subsequently removed by dredging anyway.

The deepening of the channel has the potential to alter the salinity regime within Chesapeake Bay. Tests conducted on the Corps Chesapeake Bay hydraulic model have indicated that effects will be most apparent in the upper Bay, increasing progressively up the channel into the Patapsco River. In the tests the bottom waters became saltier with over 55% of the bottom samples in the Patapsco River showing increases greater that 5ppt after deepening. Accompanying this is a trend for fresher water in the surface layers which intensifies the stratification in the water column. This was most evident during simulated high flow periods. The high elevated salinity levels and increased stratification were largely restricted to the deepened channels and some side channels.

In Virginia waters the main bay stations did not show a clear pattern of change although the surface layers displayed some elevated salinities after deepening. Some stations at the mouths of the James and York Rivers were found to have a slight reduction in the salinity of the bottom waters. No satisfactory explanation has been advanced to account for these salinity reductions. Stations at Mobjack Bay and the Rappahannock and Potomac river mouths showed no significant trends.

There is some uncertainty as to how accurately the model can represent the actual conditions in the Bay. The model can only indirectly compensate for meteorological conditions, such as wind and temperature, and not all for other phenomena like the movement of ships.

If we accept the basic results of the model, we can speculate on the ecological ramifications. In Maryland where the salinity changes are the greatest, we expect that while there may be some subtle modifications in species distributions, there should be no drastic changes. Most of the species in this part of the bay are estuarine organisms which are able to tolerate and are adapted to a naturally fluctuating salinity regime. No low salinity fish spawning areas would be affected. While the greatest salinity increases are expected in the inner Baltimore Harbor, there is no spawning there and the fauna, especially the benthos, is poorly developed. The model predicts that the major changes will occur in the deepened channels or side channels. These areas develop anaerobic conditions in the summer and consequently support only a limited benthic community. Since Baltimore is located near the up-bay limit for the stinging sea nettle (Crysaora quinquecirrha), this organism may become more prevalent.

In Virginia waters we don't forsee significant biotic changes in the main bay. In the James and York rivers a slight (approximately 1ppt) reduction in the salinity of the bottom waters at the mouth should not cause any drastic impacts unless this change was carried up the river. There is no reason to except this, but we understand that there will be continued review of the model results and their implications.

Many of the impacts of the project will be associated with the disposal of the dredged material. In Virginia the dredged material will be deposited at three open water disposal sites. Two of the disposal sites, Rappahannock Shoal Deep and Wolf Trap, are in Chesapeake Bay and have been previously used. The third site will be in the Atlantic Ocean. A testing program for metals, selected pesticides, and general chemical constituents revealed that the sediments in the Virginia channels are relatively free from contaminants. Open water disposal will cause an increase in the level of suspended sediment in the vicinity of the disposal area, but in the open bay situation the effect on the biota in the water column is expected to be minor. The major impact will be the burial of the benthos. This will not only occur within the designated disposal area but also in adjacent areas which may be affected by mud flows and redistribution of the disposal material by current forces. Since the two bay disposal sites have been previously used, we don't foresee any especially severe impacts. However, as biological information for these areas is sparse, this aspect should be studied in a monitoring program. Recolonization of the benthics is expected, but it will be delayed because the disposal operation will run over a three year period. The disposal sites will also be impacted during periodic maintenance dredging. The ocean disposal site is currently being studied by the National Marine Fisheries Service prior to receiving approval by EPA.

In Maryland the Corps has indicated that all of the material from the initial dredging will be placed in the planned Hart and Miller Islands diked disposal area. Since the Hart and Miller proposal has already been the subject of an EIS and the construction permits issued, we will not dwell on its impacts. However, it should be noted that construction of this diked disposal facility will result in the permanent loss of 1100 acres of good quality estuarine habitat in Chesapeake Bay. The State of Maryland will be monitoring the Hart and Miller disposal site to insure that it does not release pollutants into the surrounding waters.

One of the most significant impacts of the project is that it will use up most of the remaining capacity for confined spoil disposal in the Baltimore Harbor area. Since there is a continuing heavy load of polluted spoil from dredging projects in the Baltimore Harbor area, there will always be a demand for spoil containment sites. Unfortunately, acceptable sites are in short supply. The 50 foot channel deepening project will exhaust 41 mcy of the 52 mcy capacity of the Hart and Miller facility and will substantially worsen the serious problem of spoil disposal in the Baltimore Harbor area.

On of the shortcomings of the Corps study is the lack of adequate planning to identify disposal sites for the 50 year project life. The Corps estimates that if all the material from the channel deepening and maintenance is placed in the Hart and Miller facility, as is currently proposed, its 52 mcy capacity will be filled in 13 years. Actually, if it is used to contain the dredged material from some of the other Federal, State and private projects (the connecting channel to the Chesapeake and Delaware Canal approach channel, for example, will yield 72mcy), it will be filled even sooner. At this point it is unclear where the maintenance dredging material will be deposited. Although the State of Maryland has identified some potential disposal sites in Baltimore Harbor, additional disposal areas will certainly be required. We believe that it is the Corps' responsibility, in concert with the State, to see that a 50 year disposal plan is developed. Even though the 50 foot project may not significantly increase the amount of maintenance dredging, the project will greatly influence future maintenance cycles by using up most of the available capacity for confined spoil disposal.

As a consequence of the failure to develop a long term disposal plan, the Corps is following what appears to be a short-sighted policy of placing all the material from the 50 foot deepening into the Hart and Miller containment area even though much of the material from the approach channel is likely to be relatively clean. It appears to us that it would be prudent to examine other disposal alternatives, including unconfined open water disposal, for this clean material. This would save some capacity in the Hart and Miller facility for maintenance operations and other dredging projects in the Baltimore Harbor area which are likely to produce spoil which is substantially more polluted.

In summary we have the following two recommendations which are designed to minimize the adverse impacts of the project, both during and subsequent to construction.

1) The Corps should require the State of Maryland to develop a plan for spoil disposal over the 50 year project life. In order for the plan to be realistic it should recognize that demands for spoil disposal sites will come not only from the main ship channel, but also from other Federal, State and private dredging projects in the vicinity of Baltimore Harbor. In addition alternative disposal methods for the relatively clean material from the deepening of the approach channel should be examined.

2) The Corps should fund studies to monitor the effects of the project. In the near future we will be reviewing a program proposed by the Virginia Institute of Marine Science for the Virginia channels. The State of Maryland has been developing their own monitoring plan for the Hart and Miller disposal area.

Please keep us informed of any further developments in the project plan.

Sincerely yours,

for John D. Green
Area Manager

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER-81/1162

JUL 17 1981

Lieutenant General J. K. Bratton
Chief of Engineers
Department of the Army
Washington, D.C. 20314

Dear General Bratton:

The Department of the Interior has reviewed the Main Report and Environmental Statement for Baltimore Harbor and Channels, Maryland and Virginia. We have the following general and specific comments.

General Comments

The impacts associated with the disposal of spoil from the 50 foot channel deepening in Maryland have been largely dismissed by the statement that the spoil will be placed in the approved Hart and Miller facility. However, it should be pointed out that the project will result in the loss of spoil disposal capacity which could otherwise be used to accommodate the continuing heavy load of existing maintenance material. The 50 foot project and channel maintenance will cause the 1100 acre Hart and Miller facility to be filled within 13 years after the start of dredging. Since no suitable disposal sites have been designated to handle the maintenance dredging after Hart and Miller is filled, the project may be accelerating the need for a new disposal site. The result may be construction of additional containment sites with the concommitant loss of estuarine habitat in order to confine the polluted harbor spoil.

The report has failed to present a plan for the disposal of maintenance dredging material generated from the Maryland channels during the 50 year project life. As a consequence, future disposal options are being preempted. As currently proposed, Hart and Miller will be used to contain all of the dredge spoil from the 50 foot project, including the material from the outer approach channels which is largely uncontaminated natural material which could be handled with other forms of disposal (e.g., marsh creation, fill for harbor projects such as the I-95 tunnel or the Masonville terminal, or deposition overboard in selected areas of Chesapeake Bay). If a 50-year disposal plan were to be prepared, the advantages of retaining Hart and Miller for the more polluted spoils from the harbor would be more evident.

The report has not adequately addressed the potential salinity changes which may be caused by the channel deepening. The results of the Bay Model tests should be discussed more fully, including quantitative changes, limitations of the model, comparison to existing mathematical models, and ecological implications.

Specific Comments

Section K, paragraph 52. The spawning run of American shad has been drastically reduced in recent years causing the State of Maryland to introduce special fishery restrictions.

Section K, paragraph 65. Although not stated, the list of species essentially comprises those included on the Department of the Interior list of threatened and endangered species which could occur in the general Chesapeake Bay area. However, the bog turtle has no Federal status as threatened or endangered.

Section K, paragraph 84. It should be pointed out that the Dam Neck Disposal Area is likely to be phased out prior to the start of project construction. It will most likely be replaced by the Norfolk Disposal Area which is in the process of undergoing environmental baseline studies prior to being designated as an acceptable ocean disposal site by the Environmental Protection Agency.

Section L, paragraph 19. Many of the potential disposal sites listed from the report entitled "Management Alternatives for Dredging and Disposal Activities in Maryland Waters" will be unavailable for use. Four of the sites were dropped from consideration in the early planning stages by the State. The Colgate Creek site is being used for another project. Use of the Masonville site is likely to conflict with the proposed development of a marine terminal there.

EIS, paragraph 4.23. It seems unlikely that all of the dredged material will be transported out of the disposal sites in Virginia. This is indicated by the fact that the Wolf Trap site will probably have to be extended 3500 yards eastward to accommodate the accumulation of material.

EIS, paragraph 4.26. Green and loggerhead turtles may also occur in the construction areas on a transitory basis.

EIS, page 39. It is stated that chemical testing was not conducted for the Virginia channels and a portion of the Maryland channels. On the contrary, these channels were tested for selected chemicals as is pointed out later in the paragraph.

Thank you for the opportunity to comment on this proposal.

Sincerely,

Joseph E. [illegible]

Acting
Deputy Assistant SECRETARY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
6TH AND WALNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

JUL 20 1981

Mr. William E. Trieschman, Jr.
Chief, Planning Division
Baltimore District
Corps of Engineers
P. O. Box 1715
Baltimore, Maryland 21203

Re: NABPL-E, DEIS and Combined Phase I and II General Design Memorandum
Baltimore Harbor and Channels

Dear Mr. Trieschman:

The Environmental Protection Agency's comments on the Draft Environmental Impact Statement referenced above and dated May 29, 1981, have been classified as Category ER-2. The EPA has serious environmental reservations concerning the impacts of the project and further believes there is not sufficient information to fully assess all the impacts. EPA therefore requests that the Corps of Engineers provide the information which is defined in the attached detailed comments. The classification and the date of EPA's comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act.

Our major concerns center around the impacts of salinity changes especially in the Patapsco, James, and York Rivers; the former with a salinity increase and the latter two with salinity decreases. Further, the EIS made no assessment of the possible synergistic effects of the 55 foot channel to Hampton Roads in conjunction with its proposed channel deepening.

It is our understanding that a quantitative assessment including modeling of potential impacts to water circulation and salinity patterns has been made. We recommend that the model results be included in the technical appendices. Further, we would request that we be sent a copy of any reports or documents pertaining to the hydraulic model of the Baltimore Harbor and if available any reports on mathematical modeling of the Harbor and channels.

We are also concerned with the loss of Hart-Miller Island as a long-term disposal site should the 50 foot channel be constructed. Without the 50 foot channel, Hart-Miller would be available to handle Maryland's maintenance dredging problems for 50 years. The report does not sufficiently provide for long-term maintenance of the remaining spoils upon exhaustion of the Hart-Miller spoils site. No mention was made of establishing a management program similar to that in Norfolk, Virginia for spoils disposal and handling.

In conclusion, we believe there is insufficient information to assess the impact of the proposed channel deepenings. Without the information to thoroughly assess all the impacts of the proposed porject, we believe that the intent of the National Environmental Policy Act will not be satisfied. Enclosed are EPA's detailed comments to the DEIS. If you have any questions concerning our comments please contact Mr. William Muir (FTS 597-9006).

Sincerely yours,

William C. Muir

John R. Pomponio
Chief
EIS and Wetlands Review Section

Enclosure

EPA's Comments Concerning the Draft Environmental Impact Statement for Baltimore Harbor and Channels, Maryland and Virginia

1. Impacts of the 50 Foot Channel

Baltimore Harbor - according to DEIS pp. 23 there would be a change in the Patapsco River salinity of greater than 5 ppm. A worst case scenario should be prepared which identifies what this means to the environment. This should include but not be limited to the following:

a. The impact on zoography (i.e. fish migration, boring and fouling organisms, shellfish).

b. The impact on submergent and emergent aquatic vegetation.

c. The potential release of pollutants from contaminated sediments.

d. Impacts to ground water and surface water hydrology.

The model also predicted lower velocities on pp. 23 within the Patapsco River. How was it determined that there would not be an increased need for maintenance dredging on pp. L-11?

James and York Rivers - according to pp. 23 there would be a decrease in salinity. The impact of such a change should be identified.

a. The impact on zoography.

b. The impact on submergent and emergent vegetation.

c. The potential release of kepone in the James River.

2. Impact of the Hampton Roads Deepening

The Hampton Roads is expected to be deepened to 55 feet. What effect will this channel deepening have upon the 50' channel to Baltimore (i.e. Will it exacerbate potential salinity problems)?

The Port of Baltimore is a major competition of Norfolk. Would this federally supported project provide any unfair economic burden for one port over another?

3. Long-Term Disposal

The DEIS does not adequately address the 50 year maintenance problem. The Maryland report identified on pp. L-11 is outdated. At present with Hart-Miller Island, a 50 year disposal site is available. A management program to maximize the use of Hart-Miller Island must be developed. This would include the possible use of clean sand from the channels for industrial uses and possible overboard disposal of the Craighill Sections where overboard sites are available and the materials meet the criteria.

4. Monitoring

The DEIS does not provide any details on the monitoring of the channel deepening. It is our understanding that the Virginia channels will be monitored under contract to Virginia Institute of Marine Sciences. We request that the EPA be involved in the preparation of the monitoring plan and receive a copy of the monitoring reports. On the Maryland Channels, the State will be conducting all monitoring. Again we request the opportunity to participate in the monitoring program design and to receive copies of the reports.

5. Ocean Dumping

Two ocean dump sites have been identified. The Dam Neck site is the only approved site and is proposed to be phased out when the Norfolk site EIS is approved. EPA has recommended to the COE that both sites be approved for long-term disposal. The Dam Neck site would be used strictly for clean sand and the Norfolk Ocean site for all the other spoils which meet criteria. During the dredging of the Cape Henry and York Spit Channels all clean sand should be dumped at the Dam Neck site.

6. Dredging

In those sections using a hopper dredge, no economic loading should be done. This will minimize the impacts at the dredging site.

United States Department of Agriculture

Forest Service

Southeastern Area Office

1720 Peachtree Rd., NW
Atlanta, GA 30367

Reply to: 1950

Date: June 30, 1981

Mr. William E. Trieschman, Jr.
Chief, Planning Division
Corps of Engineers
Box 1715
Baltimore, Maryland 21203

Dear Mr. Trieschman:

We have reviewed the Main Report and Draft Environmental Impact Statement for Baltimore Harbor and Channels, Maryland and Virginia, and have no substantive comments to make at this time. Thank you for the opportunity to review this draft EIS.

Sincerely,

LeRoy Jones

For ROBERT D. RAISCH
Area Director

FEDERAL EMERGENCY MANAGEMENT AGENCY
REGION III
CURTIS BUILDING
6th and WALNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

June 16, 1981

Mr. William E. Trieschman, Jr.
Chief, Planning Division
Baltimore District Corps of Engineers
P.O. Box 1715
Baltimore, MD 21203

Re: Main Report and Draft Environmental Impact Statement
Baltimore Harbor and Channels
50-Foot Project

Dear Mr. Trieschman:

We have reviewed the above referenced report and have found no need to comment.

Sincerely yours,

Frederick G. Schmauk III

for Walter P. Pierson
Director
Insurance and Mitigation

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON 20426

IN REPLY REFER TO:

June 11, 1981

Mr. William E. Trieschman, Jr.
Chief, Planning Division
U.S. Department of the Army
P.O. Box 1715
Baltimore, Maryland 21203

Dear Mr. Trieschman:

I am replying to your request of May 29, 1981 to the Federal Energy Regulatory Commission for comments on the Draft Environmental Impact Statement for the Baltimore Harbor and Channels 50-Foot Project, Maryland and Virginia. This Draft EIS has been reviewed by appropriate FERC staff components upon whose evaluation this response is based.

This staff concentrates its review of other agencies' environmental impact statements basically on those areas of the electric power, natural gas, and oil pipeline industries for which the Commission has jurisdiction by law, or where staff has special expertise in evaluating environmental impacts involed with the proposed action. It does not appear that there would be any significant impacts in these areas of concern nor serious conflicts with this agency's responsibilities should this action be undertaken.

Thank you for the opportunity to review this statement.

Sincerely,

JMHeinemann
Jack M. Heinemann
Advisor on Environmental Quality

COMMONWEALTH of VIRGINIA

Council on the Environment

J. B. JACKSON, JR.
ADMINISTRATOR

903 NINTH STREET OFFICE BUILDING
RICHMOND 23219
804-786-4500

July 14, 1981

Mr. William E. Trieschman, Jr.
Chief, Planning Division
Baltimore District, Army Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203

Dear Mr. Trieschman:

The Commonwealth of Virginia has completed its review of the Draft Environmental Impact Statement (Main Report and Technical Appendices) for the Baltimore Harbor and Channels 50-Foot Project. The Council on the Environment is responsible for coordinating the State's review of federal environmental documents and for responding to appropriate federal officials on behalf of the Commonwealth. The following state agencies took part in this review:

Commission of Game and Inland Fisheries
Commission of Outdoor Recreation
Department of Conservation and Economic Development
Department of Health
Department of Highways and Transportation
Division of Industrial Development
Marine Resources Commission
State Air Pollution Control Board
State Water Control Board
Office of Emergency and Energy Services
Virginia Port Authority.

The Commonwealth has a number of suggestions and concerns with respect to monitoring and testing needs, uses of the dredged material, and other aspects of the project. Basically, we will insist upon implementation and enforcement of the monitoring program outlined in the Commonwealth's letter, dated April 24, 1981, to the Honorable James T. O'Donnell, Maryland Secretary of Transportation (reprinted in Addendum II of the Main Report and Environmental Statement).

The Commonwealth is concerned about the project's effects on Virginia's fulfillment of its water quality responsibilities. Since the project is statutorily exempt from the regulatory authority of the Marine Resources Commission and the Norfolk District of the Corps has waived interest, the only legal mechanism for protection of Virginia's interests will be the "401 Certification" issued by the State Water Control Board. Without the "401 Certification," Virginia's interests will be unprotected.

With respect to monitoring needs, it is by no means certain that previous use of the disposal areas of Wolf Trap, Rappahannock Shoal, and Dam Neck precludes changes in the biological communities from new dredging and use (section 4.22, page 26 of EIS). This project will double the annual maintenance requirement in the Virginia channels; close monitoring of the effects of dredge spoil disposal will be necessary throughout the project. Monitoring should include consideration of water quality as well as biological communities; the program under development by the Technical Advisory Committee did not, according to the documents, include water quality. An additional reason for monitoring the disposal of dredged materials in Virginia waters is the increased maintenance requirement cited above. If the frequency of maintenance dredging is increased as a consequence, Virginia and the Norfolk District of the Corps should be compensated for the extra expenses.

The Commonwealth hopes for further expansion of the model testing for salinity differences associated with the Baltimore Channel deepening. We are concerned that a shift in the average salinity in either the Bay or its tributaries could adversely affect the living resources.

Some of the dredged material might be put to practical use instead of being dumped overboard. The Department of Highways and Transportation should be contacted (see attached letter) if the idea of using dredged material as fill on its Route 664 (Hampton Roads) tunnel islands appears feasible to the Corps; the Department wishes to conduct tests on the material. Some of the dredged material might be used as beach nourishment. Disposal of material from the Cape Henry Channel should be coordinated with that of material from the Norfolk project if possible.

The State Water Control Board would like to obtain a copy of Maryland's Spoil Disposal Criteria Committee's guidelines, approved by the EPA. This should be mailed to Mr. Raymond Bowles at the Board (see attached correspondence).

Additional comments are attached. Thank you for the opportunity to review this document.

Sincerely,

J. B. Jackson, Jr.

J. B. Jackson, Jr.

Enclosures

cc: The Honorable Maurice B. Rowe, Secretary of Commerce and Resources

cc: Mr. R. Todd Coyle, Virginia Port Authority
Mr. Norman E. Larsen, Marine Resources Commission
Dr. Robert B. Stroube, Department of Health
Mr. Robert L. Hundley, Department of Highways and Transportation
Mr. Bruce B. Meador, Department of Conservation and Economic Development
Mr. Robert Burns, Virginia Institute of Marine Science
Mr. Raymond E. Bowles, State Water Control Board

JBJ/CHE/all

8. REVIEW INSTRUCTIONS.

A) Please review the document carefully. If the proposal has been reviewed earlier (e.g., if the current document is a FINAL EIS), please consider previous comments.

B) Prepare your agency's comments in a form which would be acceptable for responding directly to a project sponsoring agency.

C) Use the space below for your comments. If additional space is needed, please attach extra sheets.

Return your comments to:

Charles H. Ellis III
Environmental Impact Statement Coordinator
Council on the Environment
903 Ninth Street Office Building
Richmond, Virginia 23219

Charles H. Ellis III
CHARLES H. ELLIS III
ENVIRONMENTAL IMPACT STATEMENT COORDINATOR

C O M M E N T S

The Virginia Port Authority insists that the monitoring program outlined in the Commonwealth's April 24, 1981, response to the Honorable James L. O' Donnell designating disposal sites in the Chesapeake Bay be implemented and enforced.

The date shown on the first line of page 14 of Addendum I should be 1876 not 1976.

(SIGNED) R. Bob Cagle (DATE) July 2, 1981

(TITLE) Director of Planning

(AGENCY) Virginia Port Authority

COMMONWEALTH of VIRGINIA
STATE WATER CONTROL BOARD
2111 Hamilton Street

R. V. Davis
Executive Secretary

Post Office Box 11143
Richmond, Virginia 23230
(804) 257-0056

July 7, 1981

Mr. Charles H. Ellis, III
Environmental Impact Statement Coordinator
Governor's Council on the Environment
903 Ninth Street Office Building
Richmond, Virginia 23219

Re: DEIS and Main Report - Baltimore Harbor and Channels 50-Foot Dredging Project

Dear Charlie:

We have reviewed the above-referenced documents and offer the following comments:

1. The monitoring program which is currently being developed by the Technical Advisory Committee should have been discussed in more detail in the DEIS. There is some discussion concerning baseline monitoring of benthic communities in the primary disposal sites and alternative sites, but there is no discussion of water quality monitoring. The application of an active monitoring program to detect impacts on water quality and the biological communities as the result of dredging and disposal is essential.

2. A strong effort should be made to monitor the fate of the dredged materials placed in Virginia waters. Should this dredging be determined to increase the frequency of maintenance dredging in other channels or harbors, a system of compensation should be arranged to mitigate the resultant additional expenses to the local sponsors and the Norfolk District, Corps of Engineers.

3. Section 4.22, EIS-26. The statement is made that since the Wolf Trap, Rappahannock Shoal, and Dam Neck areas were previously used for disposal of dredged material, the biological communities should remain the same. Yet, this deepening doubles the annual maintenance requirement in the Virginia channels and the biological communities will be disturbed more than previously.

4. The model tests concerning salinity differences associated with the channel deepening should be expanded further. The potential long-term modifications, as alternations in biological communities at the mouth of the James and York Rivers as the result of increased freshwater, are mentioned, but weakly discussed.

5. Section 3.17, EIS 18. We would like to obtain a copy of Maryland's Spoil Disposal Criteria Committee's EPA approved guidelines. Please send a copy to us at the above address.

6. Page K-19, Paragraph 71 - The justification given to minimize the apparent impact seems specious. It would be more valid to compare the area disturbed to the area of the appropriate ecological zone of the Bay instead of the entire Chesapeake Bay.

7. Page K-20, Paragraph 73 - The seasonal restriction to protect the blue crabs seems to be a reasonable precaution.

Thank you for the opportunity to comment on the documents. If you have any questions regarding our comments, please don't hesitate to let us know.

Sincerely,

Ray

Raymond E. Bowles, P.E.
Director
Bureau of Surveillance
and Field Studies

:scc

cc: Mr. Charles Lunsford-Division of Ecological Studies
Mr. John P. Godfrey-Bureau of Surveillance & Field Studies
Mr. Ken Raum - SWCB, Tidewater Regional Office
EIS File

COMMONWEALTH of VIRGINIA

DEPARTMENT OF HIGHWAYS & TRANSPORTATION
1221 EAST BROAD STREET
RICHMOND, 23219

JUL [illegible]
Council on the Environment

R. L. HUNDLEY
ENVIRONMENTAL ENGINEER

IN REPLY PLEASE REFER TO

July 6, 1981

Baltimore Harbor & Channels 50-ft
Dredging Project
U.S. Army Corps of Engineers

Mr. Charles Ellis
EIS Coordinator
Council on the Environment
Ninth Street Office Building
Richmond, Virginia 23219

Dear Mr. Ellis:

Thank you for allowing us to review the above cited document.

The Department would like the opportunity to conduct tests on the material to be dredged from this project for its suitability as fill material on the Route 664 tunnel islands.

If this idea is feasible, please advise me.

Sincerely,

R. L. Hundley

R. L. Hundley
Environmental Engineer

COMMONWEALTH of VIRGINIA

Office of the Governor

Richmond 23219

April 24, 1981

The Honorable James J. O'Donnell
Secretary, Maryland Department of
Transportation
Post Office Box 8755
Baltimore Washington International Airport
Maryland 21240

Dear Secretary O'Donnell:

The Commonwealth of Virginia is pleased to submit this letter providing for the designation of disposal sites for that part of Baltimore's 50' Channel project located in Virginia waters.

Section 101 of the River and Harbor Act, December 31, 1970, PL91-611, authorizes construction of the Baltimore 50' Channel project, and requires local assurances from nonfederal interests. Item "a" of those requirements calls for the affected nonfederal interests, in this case the Commonwealth of Virginia, to provide the federal government with suitable sites for placement of dredged material resulting from the initial dredging and subsequent maintenance of the project.

In response to that requirement, the Commonwealth of Virginia agrees to the following:

1. Ocean disposal of dredged material from the initial dredging and subsequent maintenance of the Cape Henry Channel section and stockpiling of acceptable material at the Ft. Story or an acceptable alternate site for future use by the Commonwealth.

2. In the Chesapeake Bay, the use of the Rappahannock Shoal Deep and the Wolf Trap disposal sites for the placement of dredged material from the initial dredging and subsequent maintenance will be permitted only if all conditions in paragraph 1 below are met.
provided

It is understood that the use of the disposal sites in the Chesapeake Bay, as described above, is contingent upon satisfaction of the following conditions:

1. That the Corps of Engineers, in concert with the Commonwealth, will continue to work to develop a satisfactory monitoring program which includes the spoil disposal sites for the Baltimore 50' Channel project that will serve to protect and preserve the interests of the Commonwealth of Virginia and its citizens. This monitoring program will be developed and initiated prior to any actual placement of dredged material, in order to establish an existing baseline condition in the disposal areas. A portion of the monitoring may be application of sediment dispersion modeling developed by Waterways Experiment Station (WES) as appropriate.

2. That the Commonwealth prior to or during the course of construction of the project may designate alternative disposal sites in the Bay of similar costs, capacities and convenience as the agreed sites. The Commonwealth will designate these alternate sites in sufficient time to allow for baseline monitoring and evaluation and not delay the dredging of the project.

The Commonwealth of Virginia agrees to these actions which will be accomplished without cost to the Commonwealth. Any claims resulting from this construction will not be borne by the Commonwealth of Virginia.

It is also requested that once the project is under construction any contestable issue would result in immediate contact with the Commonwealth.

Sincerely,

Maurice B. Rowe
Secretary of Commerce & Resources

George M. Walters
Secretary of Transportation

cc: The Honorable John N. Dalton
Colonel Douglas Haller
Mr. James Moore

8. REVIEW INSTRUCTIONS:

A) Please review the document carefully. If the proposal has been reviewed earlier (e.g., if the current document is a FINAL EIS), please consider previous comments.

B) Prepare your agency's comments in a form which would be acceptable for responding directly to a project sponsoring agency.

C) Use the space below for your comments. If additional space is needed, please attach extra sheets.

Return your comments to·

Charles H. Ellis III
Environmental Impact Statement Coordinator
Council on the Environment
903 Ninth Street Office Building
Richmond, Virginia 23219

Charles H. Ellis III

CHARLES H. ELLIS III
ENVIRONMENTAL IMPACT STATEMENT COORDINATOR

COMMENTS

SUBJECT: Environmental Review - Project No. 462 - Baltimore Harbor and Channels 50-foot Dredging Project

From a geological standpoint, the report is well prepared and addresses all the pertinent geologic aspects. The disposal site for the Cape Henry Channel may be the same as proposed for the Norfolk-Hampton Road project. Disposal of dredge material from both of these projects should be coordinated.

EKR:sh

(SIGNED) Bruce B. Meador (DATE)

(TITLE)

(AGENCY) Conservation and Economic Development

8. REVIEW INSTRUCTIONS:

A) Please review the document carefully. If the proposal has been reviewed earlier (e.g., if the current document is a FINAL EIS), please consider previous comments.

B) Prepare your agency's comments in a form which would be acceptable for responding directly to a project sponsoring agency.

C) Use the space below for your comments. If additional space is needed, please attach extra sheets.

Return your comments to:

Charles H. Ellis III
Environmental Impact Statement Coordinator
Council on the Environment
903 Ninth Street Office Building
Richmond, Virginia 23219

CHARLES H. ELLIS III
ENVIRONMENTAL IMPACT STATEMENT COORDINATOR

COMMENTS

This agency has three remaining principal areas of concern regarding the Baltimore Harbor and Channels' 50-Foot Dredging Project. In order of priority they are:

(1) Any significant shift in the average salinity regime in either the tributaries or the Bay itself. Such a shift could impact adversely the living resources over which management responsibility is exercised by this agency.

(2) Since the project is statutorily exempt from the regulatory authority of this agency and the Norfolk District U. S. Army Corps of Engineers has waived interest in the project, if no "401" Certificate is issued by the State Water Control Board, there would appear to be no formal mechanism for the protection of Virginia's interests during conduct of the project; and

(3) That maximum practical use be made of all suitable dredged material generated in Virginia waters; particularly for beach nourishment

(SIGNED) Norman E. Larsen (DATE) June 24, 1981

(TITLE) Assistant Commissioner for Environmental Affairs

(AGENCY) Virginia Marine Resources Commission

REVIEW INSTRUCTIONS:

A) Please review the document carefully. If the proposal has been reviewed earlier (e.g., if the current document is a FINAL EIS, please consider previous comments.

B) Prepare your agency's comments in a form which would be acceptable for responding directly to a project sponsoring agency.

C) Use the space below for your comments. If additional space is needed, please attach extra sheets.

Return your comments to

Charles H. Ellis III
Environmental Impact Statement Coordinator
Council on the Environment
903 Ninth Street Office Building
Richmond, Virginia 23219

CHARLES H. ELLIS III
ENVIRONMENTAL IMPACT STATEMENT COORDINATOR

COMMENTS

The Bureau of Shellfish Sanitation has reviewed the general design memorandum for the Baltimore Harbor and Channels 50-foot Dredging Project. The Virginia section consists of the dredging of the Cape Henry, York Spit, and Rappahannock Shoal Channels.

The primary concerns of this bureau are in regard to the overboard discharge of dredged material into the Wolf Trap and Rappahannock sites. It is urged that close monitoring of the effects of dredged material disposal in these sites be carried out during all aspects of the project.

(SIGNED) ________ (DATE) June 16, 1981

(TITLE) Assistant State Health Commissioner

(AGENCY) Office of Health Protection and Environmental Management

City of Virginia Beach

July 14, 1981

Mr. William E. Trieschman, Jr.
Chief, Planning Division
Baltimore District, Corps of Engineers
P. O. Box 1715
Baltimore, Maryland 21203

Re: Baltimore Harbor and Channels, Maryland and Virginia (NABPL-E)

Dear Mr. Trieschman:

This is in reply to your notice of 29 May 1981 forwarding the Main Report and Draft Environmental Impact Statement for the referenced project.

The City of Virginia Beach strongly supports the concept of placing as much of the suitable dredged material as possible at Fort Story for use in the city's continuing beach nourishment program as discussed on pages L-6 through L-8 of the report. Even though the estimated grain size may not be ideal, it would no doubt be as good as, or better than, much of the material placed on the beach from inland borrow pits in recent years.

Accordingly, it is requested that you give favorable consideration to the use of Fort Story as a disposal/stockpile area for the material to be dredged from the Cape Henry Channel. Suitable nourishment material is difficult to obtain even when it is available. Consequently, it would be a shame not to take advantage of this opportunity to obtain a substantial supply.

Please let me know if I may be of any assistance in facilitating this matter.

Very truly yours,

George L. Hanbury

George L. Hanbury
City Manager

GLH/CAT/cg

cc: Col. Douglas L. Haller

Regional Planning Council
2225 North Charles Street Baltimore, Maryland 21218 (301) 383-5838
J. Hugh Nichols, *Chairman* Walter J. Kowalczyk, Jr., *Executive Director*

Date: July 17, 1981

Mr. Robert Blama
Project Manager
U.S. Army Corps of Engineers
Baltimore District
P.O. Box 1715
Baltimore, Maryland 21203

RE: Metropolitan Clearinghouse
Review and Referral Memorandum,
Project: 81-148 Main Report &
Environmental Impact Statement,
Baltimore Harbor & Channels

State Clearinghouse Control Number: 81-6-941

Dear Mr. Blama:

The attached review and referral memorandum is certification that the above referenced project has undergone review and comment by the Regional Planning Council and a recommended action has been determined based on the Council's findings.

Comments on this project were requested from: Anne Arundel County, Baltimore City, Baltimore County, Carroll County, Harford County and Howard County.

Comments from the following jurisdictions are included with the Clearinghouse review: Baltimore City, Baltimore County, Carroll County, Harford County and Howard County.

We appreciate your attention to Metropolitan Clearinghouse procedures. If you have any questions, please contact us at 383-7110.

Sincerely,

Stephanie O'Hara

Stephanie O'Hara, Coordinator
Metropolitan Clearinghouse

Attachment

REGIONAL PLANNING COUNCIL
2225 North Charles Street
Baltimore, Maryland 21218

R P C Meeting July 17, 1981

REVIEW AND REFERRAL MEMORANDUM

Project: 81-148

Main Report and Environmental Impact Statement, Baltimore Harbor and Channels. This is a general design memorandum regarding the proposal to deepen the existing channels and approaches to Baltimore Harbor in order to meet current and projected navigation needs. The memorandum endorses the project, which was authorized via the 1970 River and Harbor Act, and contains a Draft Environmental Impact Statement in order to comply with the Clean Water Act.

Applicant: U.S. Army Corps of Engineers

Program: 06.111 Harbor Project
05.111 EIS

COMMENT

The Coastal Zone Metropolitan Advisory Board met on June 30, 1981 to consider the general design memorandum and environmental impact statement. The board members recognized the economic importance of this project as evidenced by the very favorable cost/benefit ratio. They believe, however, that environmental risks associated with bucket and scow dredging of materials from Baltimore Harbor Channels should be avoided. Bucket and scow dredging currently underway in the Harbor should be studied, and its effects on water quality carefully considered before contractors bid on the dredging project. The costs of a cleaner dredging method should also be figured into an alternative cost/benefit ratio. If a more expensive method results in a still favorable cost/benefit ratio, user fees should be instituted to cover the additional cost. Regardless of the method chosen, careful monitoring and the willingness to interrupt dredging should water quality problems develop are very important.

The Advisory Board members also requested that more detail be provided regarding how the increased dredging rate will affect the use of the Hart/Miller Islands disposal site, what standards will be used to determine effluent limitations if water is discharged, and what authority the Department of Natural Resources will have to stop any part of the operation if standards are violated.

REGIONAL PLANNING COUNCIL
2225 North Charles Street
Baltimore, Maryland 21218

R P C Meeting July 17, 1981

REVIEW AND REFERRAL MEMORANDUM

Project: 81-148 (CONTINUED)

Additionally, the Transportation Steering Committee considered this project at its July 17, 1981 meeting and recommended endorsement.

Recommendation: ENDORSEMENT IS RECOMMENDED SUBJECT TO THE ABOVE COMMENTS

I HEREBY CERTIFY that at its 206th meeting, held July 17, 1981, the Regional Planning Council concurred in this Review and Referral Memorandum and incorporated it into the minutes of that meeting.

WALTER J. KOWALCZYK, JR.

July 17, 1981
DATE

Walter Kowalczyk
Executive Director

FROM: Mr. Larry Reich, Director
Department of Planning
222 E. Saratoga Street
Baltimore, Maryland 21202

DATE: June 3, 1981

B & P Meeting:
R P C Meeting: 6/26/81

☐ Joint RPC/CMHSA Review Cycle (up to 60 days)

REGIONAL PLANNING COUNCIL
JUN 25 1981
BALTIMORE, MARYLAND

SUBJECT: REFERRAL COORDINATOR REVIEW SUMMARY

Applicant: U.S. Army Corps of Engineers

Project: Main Report & Environmental Impact Statement, Baltimore Harbor & Channels

R & R File No.: 81-148

Comments Should be Returned By: June 17, 1981

This project has been forwarded to the following local departments or agencies (Check appropriate blanks and attach comments from the reviewing agencies):

✓ Planning

___ Public Works

___ Environmental Protection

___ Human Relations

___ Others (specify) ___

JURISDICTION'S COMMENTS

Check One

___ This jurisdiction has no comments on this particular project.

✓ This project is consistent with or contributes to the fulfillment of local comprehensive plans, goals and objectives.

___ This project raises problems concerning incompatibility with local plans, or intergovernmental, environmental or civil rights issues and a meeting with the applicant is requested (attach comments).

___ This project raises problems concerning incompatibility with local plans, or intergovernmental, environmental or civil rights issues, however, a meeting with the applicant is not requested (attach comments).

___ This project is generally consistent with local plans, but qualifying comments are necessary (attach comments).

RETURN TO:
Coordinator, Metropolitan Clearinghouse
Regional Planning Council
2225 N. Charles Street
Baltimore, Maryland 21218

Signature William M. Smith, Jr.

Title BALTIMORE PLANNING COMMISSION

Agency DEPARTMENT OF PLANNING
Saratoga St. Municipal Bldg.
222 East Saratoga St.-8th Flr.

Date Baltimore, Maryland 21202

Date: June 3, 1981

TO: Mr. Larry Reich, Director
Department of Planning
222 E. Saratoga Street
Baltimore, Maryland 21202

SUBJECT: PROJECT NOTIFICATION REVIEW

Applicant: U.S. Army Corps of Engineers

Project: Main Report & Environmental Impact Statement, Baltimore Harbor & Channels

R & R File No.: 81-148

Comments Should be Returned By: June 17, 1981

Check One

___✓___ This agency has no comments on this particular project.

________ This project is consistent with or contributes to the fulfillment of local comprehensive plans, goals and objectives.

________ This project raises issues concerning incompatibility with local plans or intergovernmental problems and a meeting with the applicant is requested (Specify below).

________ This project raises issues concerning incompatibility with local plans or intergovernmental problems, however, a meeting with the applicant is not requested (Specify below).

________ This project is generally consistent with local plans, but qualifying comments are necessary (Specify below).

Comments ____

RETURN TO LOCAL REFERRAL COORDINATOR NAMED ABOVE

Signature ________________

Title ________________

Agency ________________

FROM: Ms. Honora M. Freeman
Assistant to County Administrative Officer
Mezzanine, Old Court House
Towson, Maryland 21204

DATE: June 3, 1981

B & P Meeting:
R P C Meeting: 6/26/81

☐ Joint RPC/CMHSA Review Cycle (up to 60 days)

SUBJECT: REFERRAL COORDINATOR REVIEW SUMMARY

Applicant: U.S. Army Corps of Engineers

Project: Main Report & Environmental Impact Statement, Baltimore Harbor Channels

R & R File No.: 81-148

Comments Should be Returned By: June 17, 1981

This project has been forwarded to the following local departments or agencies (Check appropriate blanks and attach comments from the reviewing agencies):

X Planning

____ Public Works

____ Environmental Protection

____ Human Relations

____ Others (specify) ____

JURISDICTION'S COMMENTS

Check One

____ This jurisdiction has no comments on this particular project.

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RETURN TO:
Coordinator, Metropolitan Clearinghouse
Regional Planning Council
2225 N. Charles Street
Baltimore, Maryland 21218

Signature H M Freeman
Title Asst. to the Adm. Officer
Agency Administrative Office
Date 6/18/81

Rec'd - 6/17/81

Date: June 3, 1981

TO: Ms. Honora M. Freeman
Assistant to County Administrative Office
Mezzanine, Old Court House
Towson, Maryland 21204

REGIONAL PLANNING COUNCIL
JUN 24 1981
BALTIMORE, MARYLAND

SUBJECT: PROJECT NOTIFICATION REVIEW

Applicant: U.S. Army Corps of Engineers

Project: Main Report & Environmental Impact Statement, Baltimore Harbor & Channels

R & R File No.: 81-148

Comments Should be Returned By: June 17, 1981

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Comments: Water pollution problems may be intensified by the dredging operations and spoil disposal activities. All precautions should be taken to minimize water pollution impacts.

RETURN TO LOCAL REFERRAL COORDINATOR NAMED ABOVE

Signature ________

Title: Director

Agency: Bureau of Environmental Services
Baltimore County Department of Health
401 Bosley Avenue - 4th Floor
Towson, Maryland 21204

Date: June 3, 1981

to J Howell OPZ 6/10/81

TO: Ms. Honora M. Freeman
Assistant to County Administrative Office
Mezzanine, Old Court House
Towson, Maryland 21204

SUBJECT: PROJECT NOTIFICATION REVIEW

Applicant: U.S. Army Corps of Engineers

Project: Main Report & Environmental Impact Statement, Baltimore Harbor & Channels

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Date: June 3, 1981

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SUBJECT: PROJECT NOTIFICATION REVIEW

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Comments ______

RETURN TO LOCAL REFERRAL COORDINATOR NAMED ABOVE

Signature [signature]

Title Director

Agency Office of Planning & Zoning

FROM: Mr. Edmund Cueman
Director, Planning Commission
County Office Building
Westminster, Maryland 21157

DATE: June 3, 1981

B & P Meeting:
R P C Meeting: 6/26/81

☐ Joint RPC/CMHSA Review Cycle (up to 60 days)

REGIONAL PLANNING COUNCIL
JUN 25 1981
BALTIMORE, MARYLAND

SUBJECT: REFERRAL COORDINATOR REVIEW SUMMARY

Applicant: U.S. Army Corps of Engineers

Project: Main Report & Environmental Impact Statement, Baltimore Harbor & Channels

R & R File No.: 81-148

Comments Should be Returned By: June 17, 1981

This project has been forwarded to the following local departments or agencies (Check appropriate blanks and attach comments from the reviewing agencies):

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_______ Environmental Protection _______ Human Relations

_______ Others (specify) _______________

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RETURN TO:
Coordinator, Metropolitan Clearinghouse
Regional Planning Council
2225 N. Charles Street
Baltimore, Maryland 21218

Signature [signature]

Title Director

Agency Carroll County Department of Planning and Development

Date June 23, 1981

FROM: Mr. Guy W. Hager
Director of Planning
45 South Main Street
Bel Air, Maryland 21014

DATE: June 3, 1981

B & P Meeting:
R P C Meeting: 6/26/81

☐ Joint RPC/CMHSA Review Cycle (up to 60 days)

SUBJECT: REFERRAL COORDINATOR REVIEW SUMMARY

Applicant: U.S. Army Corps of Engineers

Project: Main Report & Environmental Impact Statement, Baltimore Harbor & Channels

R & R File No.: 81-148

Comments Should be Returned By: June 17, 1981

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_____ Public Works
_____ Environmental Protection
_____ Human Relations
_____ Others (specify)__________

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RETURN TO:
Coordinator, Metropolitan Clearinghouse
Regional Planning Council
2225 N. Charles Street
Baltimore, Maryland 21218

Signature [signature]
Guy W. Hager, AICP
Title Director, Planning and Zoning
Agency Harford County
Date June 22, 1981

Date: June 3, 1981

TO: Mr. Guy W. Hager
Director of Planning
45 South Main Street
Bel Air, Maryland 21014

SUBJECT: PROJECT NOTIFICATION REVIEW

Applicant: U.S. Army Corps of Engineers

Project: Main Report & Environmental Impact Statement, Baltimore Harbor & Channels

R & R File No.: 81-148

Comments Should be Returned By: June 17, 1981

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Comments: This proposal will be discussed at the June 30th, 1981 meeting of the Metropolitan Advisory Board.

RETURN TO LOCAL REFERRAL COORDINATOR NAMED ABOVE

Signature [illegible]

Title Planner

Agency Harford Co. Planning Dept

FROM: Mr. Thomas G. Harris, Jr.
Director of Planning
3430 Court House Drive
Ellicott City, Maryland 21043

DATE: June 3, 1981

B & P Meeting:
R P C Meeting: 6/26/81

☐ Joint RPC/CMHSA Review Cycle (up to 60 days)

REGIONAL PLANNING COUNCIL
JUN 18 1981
BALTIMORE, MARYLAND

SUBJECT: REFERRAL COORDINATOR REVIEW SUMMARY

Applicant: U.S. Army Corps of Engineers

Project: Main Report & Environmental Impact Statement, Baltimore Harbor & Channels

R & R File No.: 81-148

Comments Should be Returned By: June 17, 1981

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_____ Environmental Protection _____ Human Relations

_____ Others (specify) _____

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RETURN TO:
Coordinator, Metropolitan Clearinghouse
Regional Planning Council
2225 N. Charles Street
Baltimore, Maryland 21218

Signature Thomas G. Harris Jr.
Title Referral Coordinator
Agency Howard County
Date 6-17-81

Date: June 3, 1981

TO: Mr. Thomas G. Harris, Jr.
Director of Planning
3430 Court House Drive
Ellicott City, Maryland 21043

SUBJECT: PROJECT NOTIFICATION REVIEW

Applicant: U.S. Army Corps of Engineers

Project: Main Report & Environmental Impact Statement, Baltimore Harbor & Channels

R & R File No.: 81-148

Comments Should be Returned By: June 17, 1981

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Comments ___

RETURN TO LOCAL REFERRAL COORDINATOR NAMED ABOVE

Signature George F. Neimeyer

George F. Neimeyer

Title Director

Agency Dept. of Public Works

MARYLAND
DEPARTMENT OF STATE PLANNING
301 W. PRESTON STREET
BALTIMORE, MARYLAND 21201

HARRY HUGHES
GOVERNOR

CONSTANCE LIEDER
SECRETARY

July 22, 1981

Mr. William E. Trieschman, Jr.
Chief, Planning Division
Department of the Army
Balto. District, Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT (EIS) REVIEW

Applicant: Army Corps of Engineers

Project: Draft EIS - Deepening of Channels to Baltimore Harbor to 50 feet

State Clearinghouse Control Number: 81-6-941

State Clearinghouse Contact: James McConnaughhay (383-2467)

Dear Mr. Trieschman:

The State Clearinghouse has reviewed the above project. In accordance with the procedures established by the Office of Management and Budget Circular A-95, the State Clearinghouse received comments from the following:

Department of Transportation, Department of Agriculture, Department of Economic and Community Development including their Historical Trust section, Kent County and Queen Anne's County noted that the statement appears to adequately cover those areas of interest to their agencies.

Office of Environmental Programs noted (copy attached) that they have some concerns regarding the public necessity of the project since previous testimony indicates that a laek of on shore coal facilities is considered the major obstacle to the increase of coal shipments and since previous investigations raise questions as to the impact of the proposal on the water quality of the Bay. The Office recommended that the final EIS contain sufficient information to show that the benefit derived from the proposal compensate for the losses attributable to the changes in water quality.

Department of Natural Resources referenced their June 23, 1981 detailed letter (copy attached) regarding the project and indicated that the EIS is weak in its statements on dredging methodologies, sediment analysis and overflow treatment.

The State Clearinghouse appreciates your attention to the A-95 review process and expect that these comments will be useful in your continuing evaluation of the project and in the preparation of the final EIS.

Sincerely,

James W. McConnaughhay
Director, State Clearinghouse

JMc:BG:pm

cc: Stephanie O'Hara 81-148/Robert Blama/Clyde Pyers/William Lenton/Dennis Taylor
Lowell Frederick/Max Eisenberg/Wm. Eichbaum/Herbert Sachs/
Congressman Clarence Long

TELEPHONE: 301-383-2451
OFFICE OF SECRETARY

Date: 7/14/81

Maryland Department of State Planning
State Office Building
301 West Preston Street
Baltimore, Maryland 21201

DEPT. OF STATE PLANNING
RECEIVED
JUL 21 1981
REVIEWED
ANSWERED

SUBJECT: PROJECT SUMMARY NOTIFICATION REVIEW

Applicant: Army Corps of Engineers

Project: Draft EIS - Deepening of Channels to Baltimore Harbor

State Clearinghouse Control Number: 81-6-941

CHECK ONE

This agency has reviewed the above project and has determined that:

1. The project is not inconsistent with this agency's plans, programs or objectives and where applicable, with the State approved Coastal Zone Management Program. ___

2. The project is not inconsistent with this agency's plans, programs or objectives, but the attached comments are submitted for consideration by the applicant. X

3. Additional information is required before this agency can complete its review. Information desired is attached. ___

4. The project is not consistent with this agency's plans, programs or objectives for the reasons indicated on attachment. ___

Signature: Elder A. Ghigiarelli Jr

Title: Pr. Mgr. Project Eval.

Agency: Coastal Res. Div. Tidewater Admin, DNR

Address: Tawes St. Office Bldg
Annapolis, MD

Herbert M. Sachs

Note: the attached letter and comments were submitted directly to the Corps at the public hearing held on June 24.
EAG

Date: July 17, 1981

Maryland Department of State Planning
State Office Building
301 West Preston Street
Baltimore, Maryland 21201

SUBJECT: PROJECT SUMMARY NOTIFICATION REVIEW

Applicant:

Project: DRAFT EIS - Deepening of Channels to Baltimore Harbor

State Clearinghouse Control Number: 81-6-941

<u>CHECK ONE</u>

This agency has reviewed the above project and has determined that:

1. The project is not inconsistent with this agency's plans, programs or objectives and where applicable, with the State approved Coastal Zone Management Program. ____

2. The project is not inconsistent with this agency's plans, programs or objectives, but the attached comments are submitted for consideration by the applicant. XX (over

3. Additional information is required before this agency can complete its review. Information desired is attached. ____

4. The project is not consistent with this agency's plans, programs or objectives for the reasons indicated on attachment. ____

Signature: Wm M. Eichbaum
William M. Eichbaum

Title: Assistant Secretary for Environmental Programs

Agency: Department of Health

Address: 201 West Preston Street
Baltimore, Maryland 21201

cc: Dr. Max Eisenberg
Mr. Donald Torres

JAMES B. COULTER
SECRETARY

STATE OF MARYLAND
DEPARTMENT OF NATURAL RESOURCES
TAWES STATE OFFICE BUILDING
ANNAPOLIS 21401

LOUIS N. PHIPPS, JR.
DEPUTY SECRETARY

(301) 269-3041

June 23, 1981

Colonel James Peck, District Engineer
Baltimore District, U.S. Army Corps of Engineers
P. O. Box 1715
Baltimore, Maryland 21203

Dear Colonel Peck:

The U.S. Army Corps of Engineers draft report, "Main Report and Environmental Statement, Baltimore Harbor and Channels, Maryland and Virginia," May 1981, has been reviewed by appropriate agencies of the Maryland Department of Natural Resources. Among the issues addressed were the predicted change in salinity and resultant ecological changes caused by the channel deepening. Based on our review, it is concluded that the projected changes pose no serious problems for the ecosystem of Chesapeake Bay or the Patapsco sub-estuary. In general, any environmental impacts associated with the project appear temporary in nature.

There are several areas of inquiry that should be clarified in the Main Report and Environmental Statement.

1. The DEIS is weak in its discussion of dredging methodologies. It states that dredging operations in Maryland are expected to occur with bucket and scow. However, there is no definitive statement on this matter; in fact, there is suggestion that dredging methodology will be decided by the contractor.

   This point is raised because in a project of this magnitude, the dredging contractors may bid based on "economic load" considerations. Impacts associated with some dredging methods may prove detrimental to both water quality and habitat. This issue should be addressed in the EIS.

2. The report states that bulk chemical analyses, elutriate tests, and sediment analyses have been performed. The only information given in the report involves fifteen (15) samples analyzed by VIMS in 1978. The EIS should include all sediment analysis used in the formulation of the report.

3. Although not specifically stated in the supporting document, informal information indicates that there are plans to "fast track" the dredging of Baltimore channels at a rate of 16-18 million cubic yards per year. At that rate, it is likely that the sluice gates will be needed to accommodate overflow. Therefore, the method of overflow treatment must be identified and a National Pollutant Discharge Elimination System permit must be obtained within the first two or three years of operation.

In addition to these issues, the attached detailed comments, referenced by Section and page number, are submitted on the Main Report and Environmental Statement prepared by the Corps of Engineers.

Sincerely yours,

James B. Coulter

James B. Coulter

JBC/LEZ:ras
Attachment

Department of Natural Resources
Detailed Comments on
Main Report and Environmental Statement,
Baltimore Harbor and Channels,
Maryland and Virginia
U.S. Army Corps of Engineers, May 1981

SECTION H. INVESTIGATIONS

Pg. H-9 thru 11. Several utilities belonging to the City of Baltimore and the Baltimore Gas and Electric Company will need to be relocated or deepened due to the proposed dredging. These parties should be apprised of the need for wetland licenses for emplacement of submarine utility crossings and should be urged to apply for the appropriate licenses/permits at the earliest opportunity.

Pg. H-14, #52 It is reported that bulk chemical analyses, elutriate tests, and sediment analyses have been performed. Our only information concerning recent analyses involved 15 samples analyzed by VIMS in 1978. We would be interested to know what additional sediment analysis data base was used in the formulation of report.

SECTION K. ENVIRONMENTAL ANALYSIS

Pg. K-3, #11 The time period over which the 100 damaging storms occurred should be stated.

Pg. K-4, #13 In Baltimore Harbor there is a three layered circulation pattern. This should be included in the discussion.

Pg. K-6, #21 Non point sources of pollution should be mentioned.

Pg. K-7, #23 One pollutant mentioned in fourth sentence "ethion" is not a familiar word. Ethion is an organophosphate (pesticide).

The existing Maryland standards for DO should be specified.

Pg. K-9, #41 Omit the 2nd and 3rd sentences. Suggest that the 4th sentence be changed to read, "Relatively healthy plant populations are found in the eastern shore tributaries such as the Choptank, Nanticoke, and Chester Rivers." continue as written.

Pg. K-11, #52 "Heavy" runs of American and hickory shad are not in evidence. As a matter of fact there is a shad harvesting prohibition in effect.

SECTION L. PROJECT PLAN

Pg. L-11, #19 — The report cited, "Management Alternatives for Dredging and Disposal Activities in Maryland Waters" 1977 by the DNR is out of date. Some of the proposed disposal sites are no longer under consideration.

The MPA is responsible for spoil disposal site inventory, site capacity, and prioritization of disposal sites for future funding for port development. Additionally, dredging and spoil disposal requirements for port and port-related projects has been presented in a recent 5-year dredging program.

The Corps should contact MPA for the most recent disposal site evaluations. Based on information received from MPA this section should be rewritten.

SECTION O. COST ESTIMATE

Pg. 0-3, #6 — Third sentence. The figure reference is in error, should be "Figure L-5)".

ADDENDUM I

Pg. 1, #3 — Lines 2-3. The responsibility for designating spoil sites for port development belongs to Maryland DOT. DOT investigates and recommends funding for the acquisition of sites. Acquisition of sites, when funding is assured, is the responsibility of Maryland Port Administration and subject to Board of Public Works' approval.

Pg. 17, #30 — The Dredge Material Research Program did not study the spoil disposal problems of the Chesapeake Bay.

DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)

Pages EIS 24-EIS 26

#4.10. — This paragraph and paragraph 3 of the Section 404 (b) (I) Evaluation, state an éxpectation that a barge and scow dredging operation will be used in the Maryland portion of the project. There is no definitive statement on this matter, in fact there is suggestion that dredge methodology will be decided by the contractor. We raise this point because in a project of this magnitude dredging contractors may bid based on "economic load" considerations. This issue should be addressed in the Environmental Impact Statement.

#4.19. — While a dredging window may be incompatible with the proposed "fast track" dredging, a schedule that would take into account chartered oyster bars is suggested.

The work for which this EIS was prepared requires the issuance of a Water Quality Certification from this Department.

A public hearing was held on June 24, 1981. Testimony was received from various interested parties and the hearing record has been left open for a period of 30 days. Copies of the transcript of the hearing will be obtained for consideration by this office in the determination as to whether or not to issue a Water Quality Certification for the project.

A Chesapeake Bay Hydraulic Model Investigation of the impact of the project on the Bay's hydrodynamics is currently being reviewed by the State. This hydraulic model study has raised certain questions as to the impact of the proposal on the water quality of the Bay.

It is recommended that the final EIS contain sufficient information showing that the hydraulic model's findings are not valid or that the benefit derived from the project compensate for the losses attributable to the changes in water quality.

The question of public necessity becomes germane in view of the fact that testimony received at the hearing and at Congressional hearings indicated that the lack of adequate coal handling facilities on-shore is considered to be the major obstacle to the increase in coal shipments from the Baltimore region.

Citizens Program for the Chesapeake Bay, Inc.

Citizens Steering Committee
6600 York Road
Baltimore, Maryland 21212
(301) 377-6270

July 17, 1981

Col. James Peck, District Engineer
U. S. Army Corps of Engineers
Baltimore District
P. O. Box 1715
Baltimore, Maryland 21203

Dear Col. Peck,

We have reviewed the draft Main Report and Environmental Statement on Baltimore Harbor and the Maryland and Virginia Channels. In the summary of the draft Environmental Impact Statement, it is noted that there are no major unresolved issues at this time. We believe that the issue of sediment toxicity and the attendant requirement for a carefully selected method of accomplishing the needed dredging is an unresolved issue.

As an advisory committee to the EPA Chesapeake Bay Program, we are aware of some newly developed information which ought to be considered by the Corps in planning and carrying out the dredging project. The Chesapeake Bay Program commissioned two studies of Baltimore Harbor sediments, the results of which are currently available in draft form. Dr. Robert Huggett, at the Virginia Institute of Marine Science, analyzed harbor sediment samples for organic pollutants. Dr. George Helz, at the University of Maryland, analyzed sediment samples for trace metals. The findings of these two studies, which are too recent to have been included in your report, suggest to us that the dredging of Baltimore Harbor may have environmental impacts beyond those that are briefly alluded to in that report.

The purpose of this letter is to urge the Corps of Engineers to review the data generated by the Chesapeake Bay Program and be prepared to select a dredging method- other than bucket and scow- and to develop a monitoring program that will be responsive to the very specialized conditions of Baltimore Harbor. Since actual dredging will not begin until 1983, there should be adequate time for a thorough analysisof the situation in light of the most recent technical findings.

We hope our comments have been helpful and look forward to your response.

Sincerely,

Dan Gill

Davidson J. Gill, Chairman

they shall not hurt nor destroy in all my holy mountain

THE JEWISH VEGETARIAN SOCIETY

A REGISTERED CHARITY
AFFILIATED TO THE INTERNATIONAL VEGETARIAN UNION
International H.Q.: Bet Teva, 855 Finchley Road, London, NW11 8LX
Telephone: 01-455 0692

Please reply to *10 Valdivia Court/Apt. B - Twin Lakes
Rockdale, Baltimore County Maryland 21207
Tel: (301) 521-3061 24 hrs.

Date 19 July 1981

Col James Peck, Dist Eng
US Army Corps of Engineers
Post Office Box No. 1715
Baltimore, Maryland 21203

Dear Col Peck,

Deep in the hearts and minds of most people is an abiding reservoir of compassion, and a latent desire to help the less fortunate - the sick, the homeless, and the oppressed. To many this virtue is rarely extended to the lower creatures because of the inherited and erroneous philosophy that they exist soley for the purpose of sustaining human life.

In the process of living, in the pursuit of health and happiness, and in the scramble for economic progress, slowly but unknowingly, selfishness and greed tighten their grip on the individual, until with a jaundiced eye and a hardened heart, the needs of others are relegated to the unimportant. Ingenious reasons form in the mind to justify this attitude; self aggrandizement replaces altruism and actions are measured with the yardstick of personal achievement or power; and the authorities appeal to the emotions of people when it suits their particular purpose.

The Jewish Vegetarian Society strongly declares its opposition to the dumping of spoils from bucket and scow dredging of the Baltimore Harbor onto Hart and Miller Islands in the Chesapeake Bay. We feel this will disrupt the habitat of wildlife, waterfowl, and fish for many miles around the area.

All who expect kindness from others should realize that they themselves must first be prepared to extend that quality of mercy to the weak and defenseless animals who are unable to plead their own cause. We therefore urge you to rule against granting permission for this proposal.

To the creatures living at this moment in close proximity to Hart and Miller Islands, the Jewish Vegetarian Society is indeed in this instance the

Voice of the Voiceless,

Izak Luchinsky

Izak Luchinsky*
Jewish Vegetarian Society, USA
International Executive Council

FOR A VEGETARIAN WORLD

cc: Congressman Long

Baltimore, Maryland
July 20, 1981

Col. James Peck, District Engineer
U.S. Army corps of Engineers

Dear Sir:

I am writing this letter in regards to the sand dike and the dumping of the harbor sludge on Hart and Miller Islands to which I am thoroughly opposed.

I have lived for thirty years in Bowley's Quarters on the Bay front and have seen the action of the water and wind through storms and hurricanes. I do thoroughly agree with the two engineers (Kondnor and Wang) who have stated that the dike is not feasible to hold this sludge. this is also endorsed by the Mann Rep9rt.

When the Bay is subject to a storm the water becomes so rough that it destroys everything in its path; boats, piers and hard ground is torn away. When this condition occurs the sand will be washed away from the riprap and the contaminated sludge will flow out and deteriorate the entire area.

When this happens the result will be that we people who have spent so many years of our life and large sums of money in order to have a beautiful area, will have nothing but a contaminated cesspool for the Bay.

This dumping os sludge can be handled in other ways that are safe to save the Bay. We would certainly appreciate your concern for the Bay and check into the dewatering process which you have used successfully in other areas.

I am sure the Coast Guard can confirm the facts about the Bay, as I have stated, pertaining to the terrible fury that is unleashed during one of our storms.

Best Regards,

Bernard H. Lammers
3623 Bay Drive
Baltimore, Md. 21220

Bernard H Lammers

RT. 1, BOX 97-A

MARYDEL, MARYLAND 21649

JULY 20, 1981

COL. JAMES PECK

DISTRICT ENGINEER

U.S. ARMY CORPS of ENGINEERS

P.O. BOX 1715

BALTIMORE, MARYLAND ~~21203~~ Jul 22/81

DEAR COL. JAMES PECK:

IN THE DEEPENING OF THE BALTIMORE HARBOR, YOU HAVE SOME RULES TO COMPLY WITH. THE PEOPLE IN THE SURROUNDING AERA, HAVE SOME COMPLAINTS TO MAKE, THAT WILL STALL THE OPPERATION. WHERE YOU ARE SITTING THE THINGS ARRISING SEEM INSUMOUNTABLE TO BE ABLE TO GET THE JOB DONE. THE SIZE AND SHAPE OF THE CUTTING OF THE CHANEL CAN NOT BE ALTURED. THE PEOPLE WILL NOT CHANGE. THE ONLY DETAIL THAT CAN BE MOVED IS THE DISPOSAL OF THE DREDGINGS. NOW JUST SUPOSE THE MATERIAL WAS PUT IN A HOLE OF OVER FIFTY (50) MILLION CUBIT FEET, BELOW LOW TIDE, UNDER WATER, WOULD THIS SATISIFY ALL CONCERENED? THE HART-MILLER ISLAND PEOPLE WOULD NOT BE BOTHERED, THE BOATS COULD SAIL ALONG, THE FISHERMEN COULD FISH, AND LAST BUT NOT LEAST, THEY WOULD BE OFF YOUR NECK. AWAITING YOUR REPLY, I AM

SINCERELY YOURS

Henry Laque

HENRY LAQUE

July 22, 1981

Letter to the Editor
The Avenue

Dear Sir;

I am taking the time and effort to write to Col. James Peck, District Engr. U.S. Army Corps of Engrs. in support of Congressman Clarence Longs continued effort to save Hart Miller Islands from becoming a dumping ground for spoils from Baltimore harbor. I strongly urge Baltimore County residents to write to Col. Peck on the following facts from Clarence Longs testimony.

Listed are some highlights of what Congressman Long told the Corps...

* There is still strong opposition to Hart Miller--regardless of the Governors plan to move ahead in September with dike construction.

* Although Judge Murray dismissed our lawsuit on essentially jurisdictional grounds he agreed with us on many facts--such as the potential for damage to marine life and the likely structural unsoundness of the dike.

*New dangers from scows (each carrying 2,000 cubic yards of spoil) will travel from the main ship channel to Hart Miller round the clock every day for nearly 4 years, over 19,000 trips in all. These scows could ram the dike, collide with pleasure boats, or leak their toxic cargo into the shallow Bay waters, fouling even more of the Bay bottom than will be covered by Hart Miller.

*There is great risk in expecting the State to nearly triple the pace of handling spoil at Hart Miller. There is no money for such a speed-up, and the State's budget doesn't allow for any added sums.

* Deeping itself could present serious new dangers to the Bay, unless carefully contro controlled. Use of bucket and scow dredging as the Corps proposes could stir up pollutants now lying on the Harbor bottom and cause them to slop out into the Bay.

Congressman Long needs our help NOW, write a letter TODAY to Col. James Peck, U.S. Army Corps of Engrs, P.O. Box 1715, Baltimore,Md.21203. Fight back, put People Power to work. Hart Miller Islands are a creation of God, and Mother Nature. Help prevent their total destruction.

Yours truly,

Albert J. Mattes

ALBERT J. MATTES
NATURE BOY

2511 Barrison Point Road
Baltimore Md 21221
July 20, 1981

Col. James Peck
District Engineer
Baltimore, Md

Dear Col. Peck

We are indeed surprised that you are still backing the Hart-Miller Dike, especially after the revision in dredging bill made by Mr. David Stockman.

You cannot possibly know the damage such a Dike will create.

We have lived on Hawk's Cove thirty-nine years and no one has had more experience as to what will happen if you give the OK to construct the sand dike.

It will destroy the Wildlife and water fowl, habitat, the commercial fishing and crabbing plus the leakage of the spoil from the Inner Harbor. Also destroy the Marina business where mostly small boats are kept who can only go as far as the Hart-Miller Islands.

It is the poor man's Ocean City, Md where the tax-payers can enjoy a weeks vacation and do a little fishing and crabbing.

We have enough trouble when the Conowingo Dam opens the gates in the Spring. We work twenty four hours a day pushing the debris from our water front year around home and now the spoil from the Baltimore Harbor is being "pushed down our throats."

Hart-Miller is the wrong place to dump this contaminated spoil and I am sure you know this, so why are you still backing such a damaging project.

We are praying that Mr. David Stockman's decision will keep this catastrophe out of our pure and clean water.

Sincerely

Clarence & Grace Rauscher

July 20, 1981

From the desk of

JACQUELYN E. BADER

Dear Colonel Peck,

I'd like to make one statement to you concerning the sludge you are going to place on Hart-Miller Islands. And that is "Who will be the scapegoat when the families living on the shores of Seneca Creek, Middle River and Back River become victims of some dread disease or malignancy due to the leaching of the dike?"

Seeing that you are an Army man of some experience you should be terribly aware of the Love Canal and many other poisoned areas - plus - you have seen the devastation and ensuing finger pointing when heads started to roll, never mind the poor people affected.

Can you envision the headlines or listen to 60 Minutes or 20/20 sometime

From the desk of

JACQUELYN E. BADER

2/ in the future. - - - -

COLONEL JAMES PECK, U.S. ARMY CORPS of ENGINEERS, CAUSED THOUSANDS OF HELPLESS CITIZENS TO DIE OR BECOME INFECTED BY KNOWINGLY PLACING CONTAMINATED SLUDGE, FROM THE BALTIMORE HARBOR, IN CLOSE PROXIMITY TO THESE POOR PEOPLE'S HOMES. STATE, COUNTY AND CITY OFFICIALS ALL CLAIM THEY HAD NOTHING TO DO WITH THIS CRUEL AND INHUMAN ACT. THE CITIZENS OF NOT ONLY THE SURROUNDING AREA BUT EVERY CARING HUMAN BEING WROTE TO COLONEL PECK BESEECHING HIM TO STOP AND THINK BEFORE PLACING THIS CONTAMINATED WASTE IN THIS HEAVILY POPULATED AREA. COLONEL PECK DENIED ANY WRONGDOING THROUGH HIS SPOKESMAN BUT WOULD NOT FACE THE TV Cameras. A FEDERAL REVIEWING BOARD WILL

From the desk of

JACQUELYN E. BADER

3/ INVESTIGATE HOW THIS HORROR COULD HAVE OCCURRED. MEANWHILE THE U.S. ARMY IS DENYING KNOWLEDGE OF COLONEL PECK'S ACTIONS.

I rest my case

Most Sincerely,

Jacquelyn E. Bader

Mrs. Bert H. Bader
110 Galewood Rd.
Timonium, Maryland 21093

July 18, 1981

Col. James Peck, District Engineer
U. S. Army Corps of Engineers
P. O. Box 1715
Baltimore, Md. 21203

Dear Sir: 8/4/20/7

I hope that the fate of Baltimore harbor and of the Chesapeake Bay itself will not be decided on the basis of political expediency; and I do believe that the issue of Hart and Miller Islands has become a tug of war between opposing political factions.

The Chesapeake Bay with its estuaries and rivers is a gift of nature. Its beauty, its abundant marine life, its recreational uses should be treasured by the people of Maryland and by those who govern it.

I recently made a trip to Ormond Beach in Florida and was dismayed to tears to see what unthinking commercialism has done to that magnificently unique beach which is now nothing but a piece of shoddy real estate. That marvelous stretch of snow white sand that I recall seeing as a child is now little better than a city street, blackened and used by hawkers, motor cycles and automobiles. For natural beauty, so little appreciated in Florida, we will have to go to Burmuda where unspoiled beaches still exist.

I pray that Hart and Miller Islands and the surrounding waters will not be spoiled by the same type of unintelligent planning, by people who care not at all about the waters of Maryland but only for winning a ten year old argument. Those who care may lose to the locked-in thinking of those who will not yield up the islands even though a solution has been presented by Mister Clarence Long, our elected representative.

I urge you to consider what Mr. Long has to say about the dangers of scow dredging and the effects on Hart and Miller Islands if a dike is erected there. His proposal for dewatering the spoil is a practical, safe solution and should be given first consideration.

If the spoil is dewatered, I do not object to dredging the harbor, but I do not believe that dredging the harbor justifies spoiling a large area of the Bay -- which is just as great an asset as the harbor -- and your present plan will spoil it. I beg you, please listen to Congressman Long.

Sincerely,

Audrey H. Walter

Audrey H. Walter

Balto Md 21221
June. 20 - 1981

Col. James Peck.
Dear Sir,

In the concern for the location of my home on the Holly Neck Pennensula. across from Hart & Millers Island, we strongly object to the bucket and scow dredging. and the construction of the dyke.

I have lived in this area for sixty one years and learned to respect and love the upper bay. You have to be a resident here to see how high the tides rise and how strong the winds blow. We have had hurricane winds that have torn roofs off homes, ripped up piers and bulk heads, over turned cars and large boats. We have a 30 ft enbank ment in front of our home I have pictures of the waves splashing all the way to the top.

If this dyke is built, there is no way it would hold, due to the storms and winds we have. If the scows are filled with the contaminated spoil and that a storm should hit. There is a dange of the spoil going into the bay. This would cause a fish and crab kill and ruin the water for recreation

I am writing this to you not just for my concern also the members of the Holly Neck Improve Asso. that dissapprove of the dredging. We are worried about a health hazard to our area.

Yours truly
Margaret Z. Lemann
Treas. Holly Neck Improv Ass

2618 Holly Beach Rd.

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